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AMERICAN INDUSTRIES.—No. 46.

THE MANUFACTURE OF UNIVERSAL CHUCKS.

Probably no single tool used in the machine shop has effected so great a saving of labor as the Universal Chuck, and there is none requiring more painstaking and careful labor in its manufacture. It is a tool that must be well adapted to hard usage, and at the same time its construction must be such as to neither wear out of true nor get out of order. In the well known manufactory of the E. Horton & Son Company, of Windsor Locks, Conn., universal chucks are made which fulfill all these requirements, and which are ranked as the standard. It would be superfluous to say a great deal in favor of these chucks, as they are well and favorably known throughout the world.

When Eli Horton invented the chuck known as the Horton lathe chuck, there were but a few iron chucks in use of any kind, and they were very imperfect and unreliable, giving great dissatisfaction, so much so that in many instances large establishments would use only the old method of fastening wood plank to the face plate of the lathe, which was very expensive. Mr. Horton, then a machinist of over thirty years' experience, in want of a good lathe chuck, invented the chuck which has since borne his name.

There are many thousands of these chucks in use in the best shops in the country, and a single instance is not known where a party has purchased these chucks and afterward changed to any other kind.

By means of the gearing in the Horton lathe chucks, the jaws can be adjusted to a true circle within one hundredth part of an inch, to counterbalance any wear of parts. We know of no other chuck that can be so closely adjusted as this.

The castings are made of a fine quality of iron, and the jaws are made of the very best wrought iron; the racks are made of wrought iron; the pinions and screws, of the best cast steel, with wrenches of wrought iron, case hardened.

It was proved by testimony taken at the Patent Office that the Horton lathe chucks make a saving in time (taking the time of cleaning and adjusting other kinds of chucks into account) of over one hour each day while in use. This was the lowest time given, while some witnesses testified that from one to two hours each day were saved.

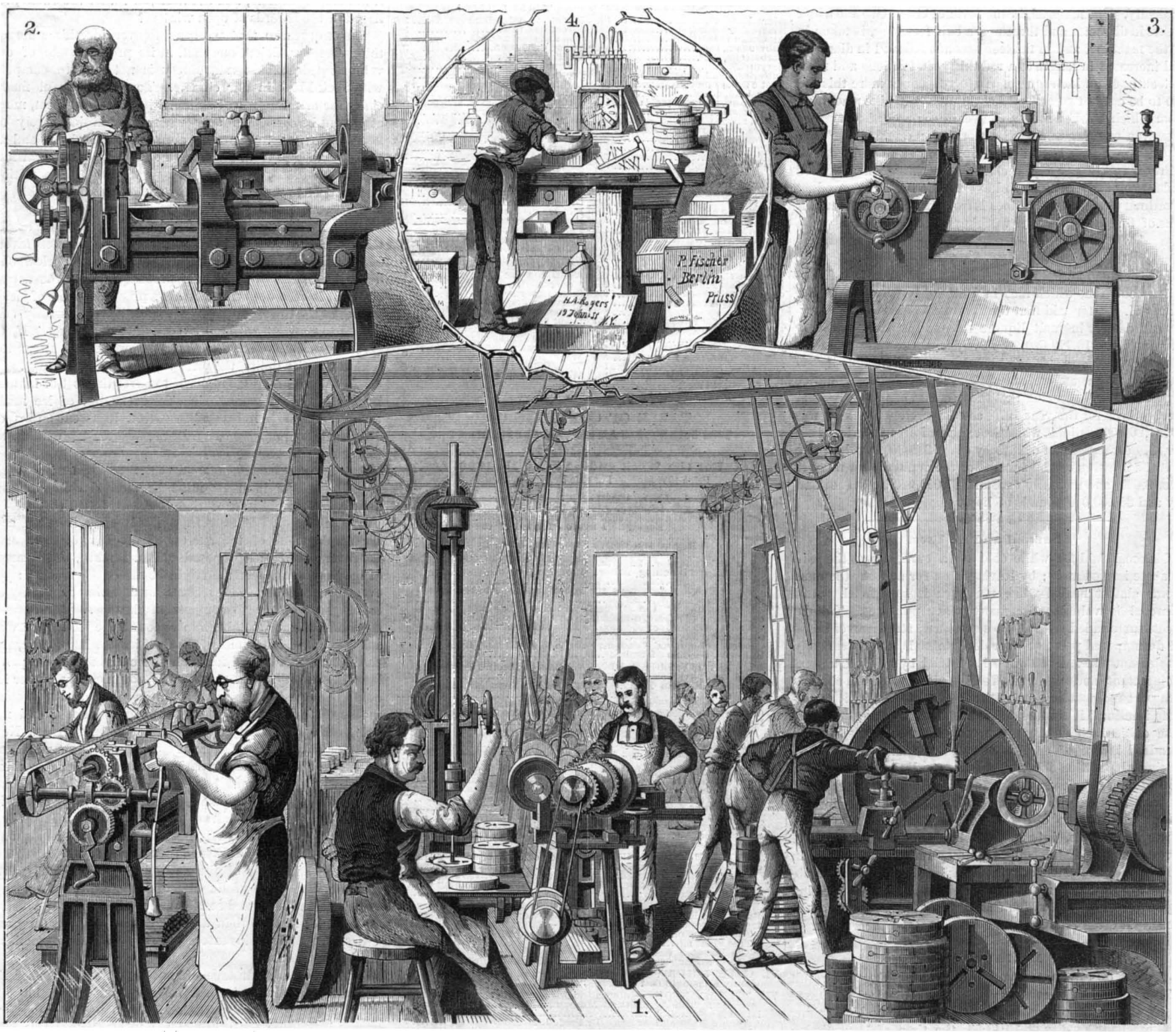
These chucks cost, in the first place, no more than other kinds of chucks, and they can be used either as independent or universal chucks, really making two chucks combined in one. This taken in connection with its other good features makes it the cheapest tool of the kind in use.

Both three and four jawed chucks are made, as well as reverse jaw chucks and milling machine chucks. The three jawed chucks vary in size from six to thirty-six inches, and the four jawed chucks range from six to thirty inches. An improved jaw is used in these chucks, which admits of being ground perfectly true after all the parts are assembled. This operation is rendered necessary by the liability of iron to change its form during the process of case-hardening. In this establishment, nothing but the Horton chuck is made, and only the best machinery and best workmen are employed.

The larger view in our engraving represents the general machine shop, in which the greater portion of the work is done. The machines in which the operations of turning, boring, drilling, and screw cutting are carried are shown in the foreground of the view. Fig. 2 shows the machines for cutting the screws employed to operate the jaws of the chucks. Fig. 3 shows the machine for grinding the jaws of the chucks after they are put together; and Fig. 4 represents the department in which the chucks are packed preparatory to shipping them to all parts of the world.

The manufacture of these chucks was commenced in 1855 by Messrs. E. Horton & Son, and was continued by that firm until the death of the son, when the style of the firm was changed to The E. Horton & Son Company, E. Horton being chosen president, and E. B. Bailey, secretary and treasurer.

In March, 1880, owing to the death of Mr. E. Horton, the inventor of the chuck, the company was reorganized, Mr. J. H. Hayden being elected president, Mr. E. B. Bailey, secretary and treasurer, and Mr. Dwight Slate, of Hartford, Conn., superintendent of the mechanical department.



THE MANUFACTURE OF UNIVERSAL CHUCKS.—THE E. HORTON & SON COMPANY WINDSOR LOCKS, CONN.

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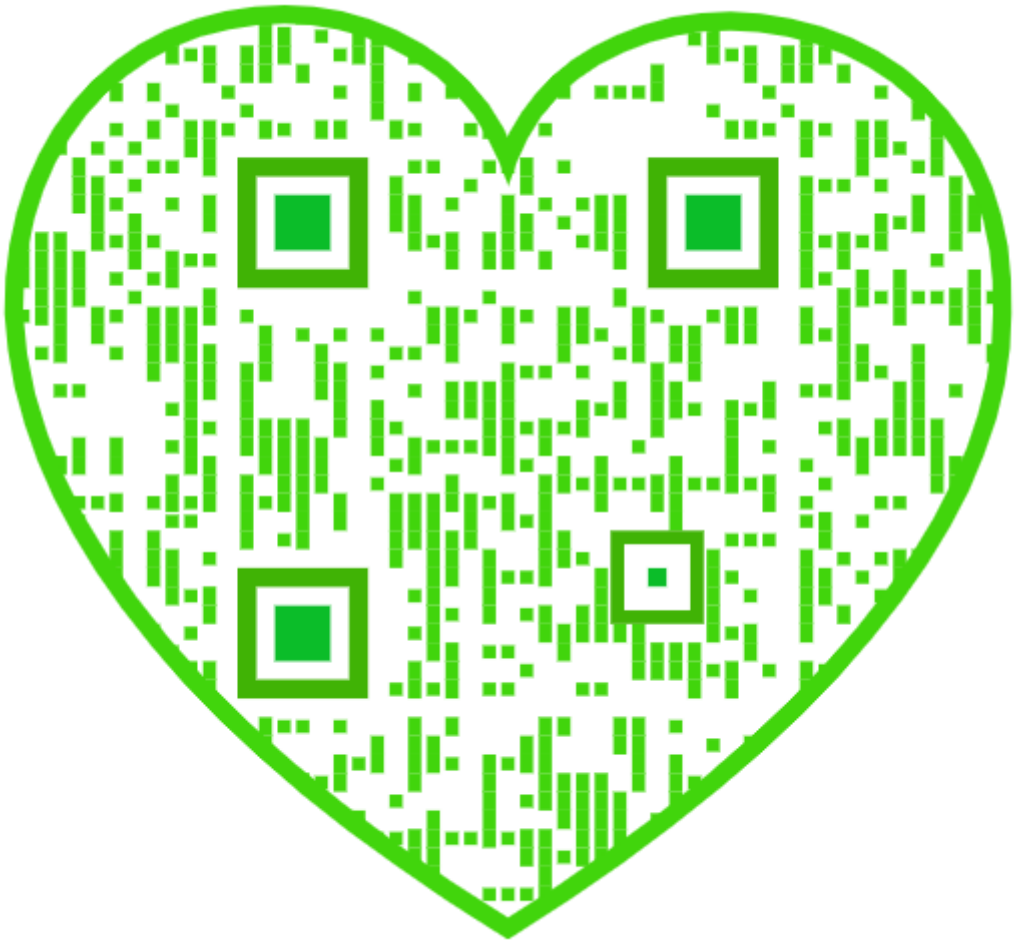

The company is constantly making improvements and adopting anything that is new and calculated to improve the value of the chucks. Their foreman, Mr. Knight, has given the benefit of a long experience in this line of manufacture, and attends personally to the difficult parts of the work.

The officers of this company are all well known business men, and it is their determination to keep up the standard and reputation of the chucks.

We are informed that the number of orders is increasing from year to year, and that these goods are sent to all parts of Europe, to China, India, Japan, South Africa, South America, and Mexico.

GREAT YIELD OF A BLAST FURNACE.

Furnace B of the plant now in process of completion at the Edgar Thompson Steel Works, Pittsburg, Pa., has recently made a record unparalleled by any blast furnace in the world. The following is the yield in pig metal for seven consecutive days in May: Saturday, 148 tons; Sunday, 156 tons; Monday, 184 tons; Tuesday, 168 tons; Wednesday, 165 tons; Thursday, 166 tons; Friday, 154 tons. Total, 1,141 tons, or an average daily (24 hours) production of 163 tons. Furnace B is 80 feet high and 20 feet in the bosh, and in general design does not differ materially in its lines from other blast furnaces. In its appointments, however, furnace B is especially notable for the heating capacity of the stoves and the power of its blast. The ores used were not especially rich, averaging less than 60 per cent during the period of this enormous run. Hitherto the best record of the "Lucy" furnace, Pittsburg, Pa.—142 tons—was considered a remarkably good day's work, but furnace B, to use a Western expression, "takes the horns." During March last the product of the rail mill of the above steel works was 9,538 tons finished steel rails, or just about 1,000 miles.

A Shower of Railroad Spikes.

The great demand for railroad spikes has called into existence a remarkable machine, now in successful operation at the establishment of Dilworth, Porter & Co., Pittsburg. It is the invention of the late Mr. James Swett, and comprises a series of "continuous" rolls handling the material automatically. The material, in the form of billets two and a half inches in diameter and three and a half feet long, is taken in by the machine, and in thirteen seconds reduced in diameter and increased in length to a rod thirty-six feet long and nine-sixteenths of an inch square. In forty seconds more this rod has to be cut in two and passed through two spike machines, from which finished spikes shower at the rate of forty tons every ten working hours. By working "double time" five of these machines have turned out eleven hundred kegs of railroad spikes per day, each keg containing one hundred and fifty pounds, or thirteen kegs to the ton. The product of ordinary rolls and machines is from two to two and a half tons of finished spikes per working day of ten hours.

The Brewers' Association.

In his annual address as president of the American Brewers' Association, which met in Buffalo, N. Y., June 2, Mr. Henry H. Rueter said that the revenue collected from brewers and dealers in malt liquors during the last fiscal year amounted to $10,729,320, or nearly $800,000 more than for the year preceding. Since 1863 the internal revenue tax on malt liquors has amounted to $120,446,863.67. A committee report was read showing that the decrease of importation of foreign beer for the year 1879, as compared with 1875, was over 1,269,000 gallons, while the exportation of American beer for 1879 exceeded that of 1875 by over $216,000 in value; also that the brewing establishments of the country now number over 3,000, and annually consume 35,000,000 bushels of barley and 35,000,000 pounds of hops.

Charcoal and its Uses.

Charcoal, laid flat while cold on a burn, causes the pain to abate immediately; by leaving it on for an hour the burn seems almost healed when the burn is superficial. And charcoal is valuable for many other purposes. Tainted meat, surrounded with it, is sweetened; strewn over heaps of decomposed pelts, or over dead animals, it prevents any unpleasant odor. Foul water is purified by it. It is a great disinfectant, and sweetens offensive air if placed in shallow trays around apartments. It is so very porous in its "minute interior," it absorbs and condenses gases most rapidly. One cubic inch of fresh charcoal will absorb nearly one hundred inches of gaseous ammonia. Charcoal forms an unrivaled poultice for malignant wounds and sores, often corroding away dead flesh, reducing it to one-quarter in six hours. In cases of what we call proud flesh it is invaluable. It gives no disagreeable odor, corrodes no metal, hurts no texture, injures no color, is a simple and safe sweetener and disinfectant. A teaspoonful of charcoal, in half a glass of water, often relieves a sick headache; it absorbs the gases and relieves the distended stomach pressing against the nerves, which extend from the stomach to the head. It often relieves constipation, pain, or heartburn.

Rapid Cabling.

A press dispatch of eleven words, announcing the result of the recent Derby race, was filed at the office of the Direct Cable Company in London at 10:43 A.M., New York time, and reached this city at 10:43:25, the time of transmission from London to New York being 25 seconds

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NEW YORK, SATURDAY, JUNE 19, 1880.

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THE PROBLEM OF THE ICE SUPPLY FOR NEW YORK CITY.

The actual cost of cutting and storing ice during an ordinary winter is said by experienced Hudson River ice men to average about twenty cents a ton. There is a considerable shrinkage while the ice remains in the store house. In breaking out and loading a further loss is experienced. A third loss occurs in the course of transportation to markets; still another in transferring the ice to the delivery wagon; last, though by no means the least, comes the wastage during delivery, especially to small consumers. When the handlings are many, the transportation far, and the weather warm, the loss by melting and breaking reduces the original stock one half. In bringing ice from a distance by sea in schooners of three or four hundred tons burden, such as are employed in the transportation of ice from Maine to this city, the wastage on the voyage amounts to about one-third. It must be remembered also that ice is bulky and heavy as well as cheap, and freightage soon equals the original cost. And with a commodity so perishable, the shipper's margin of profit must be large to cover the risk.

Accordingly the small consumer of ice must expect to pay, under the most favorable circumstances, several times the first cost of it. And unfortunately the conditions of the trade are such that a few large companies, too often a single company, may have a practical monopoly of the trade of a city, and will take every opportunity to put the price up to the highest that individual consumers can be made to pay. Thus the Knickerbocker Ice Company was able, a few years ago, to charge large consumers twenty dollars a ton and families twice as much, or two dollars a hundredweight. The open winter just past is made the occasion of something like an ice famine in this city, and the price is pushed up to ten dollars a ton, though excellent ice is sold at the store houses of the Kennebec for one dollar a ton, and twice as much more will bring it to this city and deliver it with profit, allowing an ample margin for transportation, wastage, and risk.

At such times of high prices, whether due to a real failure of the ice crop or to the natural disposition of monopolists to make the most of their opportunities, the question of artificial production usually comes up. New York manufactures ice making machinery for use in other places; why is it not employed here, and the trade, or rather the public, relieved of the hazards of open winters?

The only reason that we can discover for this state of things is the sufficient one that, in its present state of development, ice-making machinery is not able to compete with Jack Frost in our climate. To be successful financially the manufacture of artificial ice, it would seem, must at present be carried on only where natural ice rarely or never forms, where water is abundant and cheap, and at points so distant from the sources of supply of natural ice, or so unfavorably situated with respect to transportation facilities, as to make natural ice practically unattainable, or at best, very dear.

From the best information that we have been able to obtain the cost of artificial ice has never, under the most favorable conditions in actual practice, been reduced below one dollar a ton, and two dollars is probably nearer the actual cost. It is even doubtful whether a process capable of yielding ice at the lower rate given could be successfully employed to compete with natural ice in this market. If, to save transportation and shrinkage, the work were attempted within the city limits, the price of the water necessary to be employed would go far by itself to cover the cost of natural ice in an ordinary season; since for every ton of ice made there would be required from fifteen to twenty tons of croton water simply to carry off the heat to be withdrawn from the water frozen.

And it must be remembered that the production of artificial ice as an industry must be able to compete with nature, not merely in exceptional seasons, but at all times.

By the adoption of artesian well-water for freezing, and the employment of the current of the East or the North River for cooling, as proposed by Mr. Rankin, this element of the cost of artificial ice might be materially reduced: yet even then there are grave reasons for doubting the ability of existing machinery to compete in cheapness with nature, especially when we take into account the liberal ground space required in the manufacture of ice on a large scale, and the high rental charged for such space and for wharf privileges in this city. The question is not merely whether ice could be made here so as to sell at a profit at the present market rate, but whether the same investment would not bring a larger quantity of natural ice from northern New York or from Maine, where the crop is always abundant and sure. And the same comparison must be borne in mind with regard to seasons less favorable to artificial ice, and they are the great majority, when the Hudson yields its usual supply and the market price is correspondingly low. The ice trade of the north, however, is an enormous one; and, though our ice-makers are unable as yet to wrest it from the harvesters of the natural crop, it is well worth working for. The production of ice-making machinery is still in its infancy; and so long as it is theoretically possible to make ice for less than a dollar a ton in or near our great cities, just so long inventors will have in this a promising field to work in.

The obvious advantage of an ice manufactory near the market place, in saving the expense and loss incident to winter storage, transportation, and repeated handling, makes it possible for artificial ice to compete successfully with winter ice, even when the first cost is several times that

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of cutting and housing the natural product. The sanitary advantage of ice frozen from pure water, over ordinary river and pond ice, is another important item in its favor, and one which will reconcile intelligent consumers, if necessary, to a price measurably exceeding that of natural ice.

Whether the cheaper water and cheaper land obtainable at a distance from the market place would more than offset the expense and wastage involved in transportation and extra handling is a matter to be determined. It may be that the most economical place for ice manufacture for New York consumption, all things considered, would be up the Hudson where the water is sweet, perhaps above the State dam at Troy. Ground space opposite or above Lansingburg would be comparatively inexpensive. The water could be drawn from the river and would be uncontaminated by the sewage of Albany, Troy, and the adjacent towns, as would be the case if the works were located further down the river. The condensing or cooling coils could be submerged in the river, and one of the chief items of cost in the production of ice artificially would thus be avoided. The ice as fast as manufactured could be placed on river barges such as are now employed in the trade, and the daily product could be towed down the river cheaply and with comparatively slight wastage. If the claims advanced by the makers of ice-machinery are verifiable in practice on a large scale there ought to be a good margin for profit in an undertaking of this character. If existing machinery will not justify the experiment—and we do not see why capitalists are neglecting it if the opportunity is real—then our inventors should look to it. As already remarked, the field is wide and inviting.

THE MILLERS IN COUNCIL.

The Millers' International Exhibition at Cincinnati, for which preparations have been making for many months, was opened on the 31st ult. It presents undoubtedly the completest display of milling machinery in full operation, and all appliances connected with the trade, together with the largest collection of different varieties of grain and flour, that has ever been brought together in this or any other country. The Millers' National Association fixed the time of holding their annual convention for the first week of the Exhibition, as the latter is to last four weeks, and besides a full attendance of members of the trade from all parts of the United States, an imposing delegation of the leading millers of Great Britain, France, Germany, and Austria, are in attendance.

For many reasons this Exhibition and the assembling of representative millers from all parts of the world is of the utmost significance at the present time. Our exports of wheat for the nine months to the 1st of April last amounted to $149,012,749, and in wheat flour the exports for the same period were valued at $26,375,228. The quantities were smaller, although the proportions were about the same for the like period of the year preceding. The question immediately arises: Is it not possible for our millers to largely increase the quantity of flour, in proportion to wheat exported? To do this would be by so much to enlarge the field for the employment of American labor and capital. Perhaps the most important object of the Exhibition, however, and it is intimately connected with the above question, is the comparison of the methods of milling adopted in various countries. And here we find a very complicated state of affairs; indeed if this were not so it is hardly probable that so influential a delegation of foreign millers would have come across the ocean to see what our millers are doing. It is the habit of American manufacturers, mechanics, and artisans, to perfect their own processes partly by watching closely what every one else is doing in the same line, either at home or abroad; but it is generally the rule with foreigners to scout the idea that anything can be learned in regard to the older trades from our experience. Now, however, these foreign millers want to find out something about the making of our new process flour; they want to know something about the improvements we have been making in milling for the past ten years, whereby our millers have rendered it a task of constantly increasing difficulty for them to hold the business of making flour for their own markets. And the welcome extended to them, and the facilities they are afforded for examining the machinery and looking into the workings of all our large establishments, present a striking contrast to the exclusiveness which most foreign manufacturers maintain toward all would-be visitors.

Just what the new process is it would be impossible to define specifically, for what might be the new process with one establishment may have become substantially an old one with another. The business has been constantly changing within the past few years, the general direction of the movement having been toward the introduction of chilled iron rolls operating in connection with the burr stones, and reducing the wheat two, three, or more times, instead of once, as formerly. Hardly any two millers agree exactly as to what is the best method, but there is a general concurrence of opinion among the leading members of the trade that the plan of gradual reduction, with repeated purifications and regrindings, is the best, although, in thus making a smaller proportion of flour of the finest grades, they have a large proportion of other products, which it will take some time to generally classify. Of all these methods, however, foreign millers will have an excellent opportunity to judge, while our own millers will undoubtedly make the most of an examination of several full sets of English and German milling machinery shown at the Exhibition, as well as obtain much valuable information from a comparison of views with so many of the leading representatives of the trade abroad. Among the mechanical features which are likely to receive particular attention, the magnetic separator, for removing all iron particles from the wheat, is one of the newest. It is astonishing in what a variety of shapes iron finds its way into the wheat, not only from the wire used in binding, but in the way of nails, pins, pieces of reapers, etc., and even as ore dust from wheat lands of this character. The damage heretofore done to the stones and bolting cloths from this cause has been great, and many fires have been caused thereby. Our elevator system of handling grain will likewise be of particular interest to our foreign visitors, where our methods of handling and storing are almost unknown. But, while they will give no little attention to the various differences of classification, and while the conceded objects of both foreign and American millers at this meeting are to discover how best to make the purest and finest flours, we hope the opportunity will not be allowed to pass for these representatives of the trade to properly stigmatize the not unusual practices which have grown up of late in adulterating flour. The mixture of white corn or barley flour with wheat flour is now done by some millers to an extent which would perhaps quite counterbalance the improvement made by others in the quality of their product, while it is well known that alum is used to some extent. For the credit of the trade, as well as for the benefit of the community, we hope that such practices will receive their deserved rebuke, and if possible effectual exposure, at the hands of the millers assembled in Cincinnati.

THE HOWGATE POLAR EXPEDITION.

The steamer to convey the Howgate colony to the Arctic regions has been overhauled and specially strengthened for the service at Alexandria, Va., and has received her outfit at the Washington Navy Yard, preparatory to sailing June 10. The chosen vessel is the Gulnare, a Clyde built steamer of 230 tons.

She is 140 feet in length, and 21 feet 6 inches breadth. The engine is 200 horse power, and has two 30 inch cylinders, each 24 inches stroke. Additional strength has been given by filling in 2½ inch oaken plank between the iron frames and sheathing inside and outside with stout oaken planks, thus making the hull uniformly 15 inches thick. The inside of the hull has been braced with extra heavy white oak timbers placed horizontally. Three heavy white oak breast hooks have been placed inside of the prow, and on the outside of the bow is a sheathing, three-eighths of an inch of iron armor, extending 10 feet deep and 14 feet aft from the stern. In addition on the sides of the vessel extending above the water line there have been placed wedge-shaped oak timbers to be used in easing the vessel upward when pressed by heavy ice. A new main deck has been constructed, and a new smokestack and an extra propeller provided. A new bridge 21 feet long has been placed amidships. The forward part of the vessel will be used for the seamen. Aft of the engine and boiler is the cabin, with staterooms which will accommodate the officers and scientists. The Gulnare will carry in addition to her steam power mainmasts and foremasts and duplicate sets of new sails.

Accommodations are provided for forty persons, twenty-five of whom comprise the polar colony, consisting of Lieut. A. W. Greely, Fifth United States cavalry, commander, with, as assistants, Lieut. G. C. Doane, Second United States cavalry; Lieut. W. H. Low, Twentieth United States infantry; Henry Clay (grandson of Henry Clay); Astronomer —Orray Taft Sherman, who was connected with the Florence Expedition, and as assistants, George H. Rohie, W. S. Jewell, and O. Aldrich, of the Signal Corps United States Army; Surgeon and Naturalist, Dr. Octave Pavy; Photographer, J. W. Rice; and fourteen enlisted men as a working party. In addition to these two half-breeds have been engaged as dog drivers, and will join the vessel at a place called Rigolette, on the coast of Labrador.

The steamer carries two years' supply of provisions for the colony, and rations for the ship's crew for sixteen months, though it is expected that the voyage will be made in five months. A double-walled frame house, 21 x 65 feet inside, is carried for the colony, besides the usual outfit for traveling parties. The station will be provided with a steam yawl and two whaleboats for water exploration, and six sledges, with dogs, for land work. It is expected that fuel will be obtained from a coal vein at the site of the proposed station.

The outfit includes the following scientific apparatus, in addition to a proper supply of surgical and medical instruments and appliances.

Meteorological.—12 spirit thermometers, 12 mercurial thermometers, 12 maximum thermometers, spirit; 3 maximum thermometers, mercurial; 6 psychrometers, mercurial; 6 psychrometers, spirit; 12 minimum thermometers, spirit; 6 black bulb thermometers, in vacuo; 6 black bulb thermometers, free; 1 Regnault's hygrometer, dewpoint apparatus; 3 rain gauges, 6 standard barometers, 6 aneroid barometers, 6 anemometers, standard; 3 self-registers for anemometers, 3 wind vanes, 6 water thermometers, in cases, complete.

Astronomical.—3 sextants, 6 chronometers, 2 magnetometers, 2 fox circles, 6 telescopes, 6 binoculars, 2 spectroscopes, 4 heliographs, 4 sets drawing instruments, 6 sets signal equipments. In addition to a well selected collection scientific works, and an unusually fine collection of Arctic works, a large quantity of miscellaneous reading matter has been contributed by friends of the expedition.

On leaving Washington the Gulnare will proceed under sail (to save fuel) to St. Johns, N. F., where she will stop for additional coal and an ice pilot and any further supplies that may be needed.

From St. Johns the vessel will go to Rigolette and take on board the dog drivers and the sledge dogs, which are expected to be ready for the expedition. From Rigolette she will go to Disco, using steam only when absoluely necessary.

At Disco the coal bunkers will be refilled from the supply left by the Polaris, or, failing that, from the Danish stores, and then the vessel will be pushed forward as rapidly as possible to Lady Franklin Bay, where the colony and outfit will be landed. If weather and water prove favorable the vessel will return to the United States with as much speed as practicable. It is expected that she will reach Washington on her return by the middle of October.

OUR IRON AND STEEL IMPORTS.

The recent labor troubles in the iron industry of Western Pennsylvania give especial interest to the figures furnished by the United States Bureau of Statistics, relative to our increased imports of iron and its manufactures. Without touching at all upon the merits of the questions at issue, from the laborers' point of view, the practical one, which concerns consumers as well as producers—the price at which iron and its manufactures can be maintained and meet with the largest market for the product of the mills—meets here a significant answer. The imports of this class are all dutiable, and there seems to be now no probability that we shall have any change in the tariff thereon during the present session of Congress. Yet, notwithstanding these duties, our imports of iron and its principal manufactures have increased enormously within the past few months. The "boom" in the iron industry, which, so short a time ago, seemed to promise an extremely active business throughout all of 1880, at prices that were "out of sight" of those obtainable a year ago, has entirely subsided, and, with the flood of foreign goods which has been coming in, prices have so declined that it is evident, even with the enormous consumptive demand we are having, that fancy figures will not be obtainable hereafter. The iron manufacturers here will have to compete with those abroad, with the advantages of the tariff in our favor, it is true, but with heavy stocks, lower rates for wages, and more abundant and cheaper capital to the credit of the other side of the account.

In the three-quarters of a year preceding April 1, 1879, our imports of pig iron amounted to only $1,366,700; for a like period to April 1, 1880, they were $7,291,453, but the price of American pig in New York the first of this year was $35 per ton, against $17 per ton the 1st of January, 1879. The imports of old and scrap iron for the first mentioned period were but $66,967, but for the corresponding nine months a year later they were $6,705,190. In steel ingots, bars, sheets, and wire, we took from foreign manufacturers in the first period to the value of $837,631, against $2,463,127 in nine months a year later; in bar iron we bought $1,037,205 in the former, as against $3,159,606 in the latter period; and in miscellaneous manufactures of iron and steel the imports stand at $1,595,020 for the nine months to April 1, 1879, against $3,416,065 for a similar period to April 1, this year. A corresponding increase was also experienced in imports of boiler iron, band and hoop iron, railroad bars of iron and steel, sheet iron, hardware, anchors, cables and chains of all kinds, machinery, and cutlery, and there was even an increase in our imports of firearms, which amounted to $466,426 for the former as against $608,072 for the latter period. The only articles not reported as showing an increase are saws and tools and general castings, of which our importations were insignificant during both periods.

We have here given the figures relating to only one of our leading industries, although in many other branches of business like comparisons present themselves. In none, however, are the extremes more conspicuous, both as to prices and the increased imports, than in this department. This comes naturally enough, probably, from the great activity in railroad building, and from the wonderful growth experienced in nearly every branch of manufactures, but our iron-masters already see that extreme profits and speculative prices cannot be hereafter obtained. From a general point of view the situation is in every way encouraging, for our enormous exports of grain, provisions, and cotton still turn the balance of trade in our favor; money is abundant and cheap in all the leading centers, trade is the more healthy for the diminished tendency to speculation, and there is everywhere plenty to do for those who are willing and able to work; but, our money being good now all over the world, the standards of value here for manufactured goods must inevitably bear a fixed and definite relation to the prices obtained for like articles in the leading foreign markets.

The Millers' National Association.

At the meeting of the Millers' National Association, in Cincinnati, June 2, in connection with the Millers' International Exhibition, Mr. Alexander H. Smith, chairman of the committee on patents, advocated more liberal appropriations by Congress to the Patent Office, the abolition of the reissue of patents under new titles, the establishment of a patent court, and reforms with reference to rules for estimating damages in cases of infringement. At the same time Mr. Smith took occasion to denounce "the thieves who steal foreign processes and patent them in this country."

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Sir Joseph Whitworth.

At the late meeting of the British Iron and Steel Institute in London, the Bessemer Medal for 1880 was conferred upon Sir Joseph Whitworth, whose successes as a mechanician have earned for him a world-wide reputation.

Sir Joseph was born December 21, 1803, at Stockport, Cheshire, England. At the age of fourteen he entered his uncle's cotton mill in Derbyshire; and in 1821 he proceeded to Manchester, where he spent four years in the machine shops of Crighton & Co. and others. He afterwards spent several years in noted London workshops. In 1833 he returned to Manchester, and started business on his own account as a manufacturer of engineers' tools. It was here that he first became generally known for superior workmanship and for his inventions for the improvement of machinery, the production of true surfaces, etc. His theories on the latter score were announced in a paper read before the British Association at Glasgow in 1840, and during the next ten years he was able to carry them out practically in various mechanical inventions and improvements, among them the duplex lathe, the reversing tool of the planing machine, interchangeable nuts and screws, and standard gauges. His tools achieved especial distinction at the great Exhibition of 1851, where he received the Council Medal for a measuring machine of wonderful delicacy and exactness. He was one of the Royal Commissioners to the World's Fair in this city in 1853, and on his return he undertook for the British Government the construction of machinery for the improved production of firearms. Since that time he has been one of the leading exponents of the science of gunnery

He was elected Fellow of the Royal Society in 1857, and has won several grand prizes at international exhibitions for improvement in cannon and in the working of steel. His strongest claim for permanent favor and honor rests, however, upon the "Whitworth Scholarships," which he founded in 1869 for the encouragement of mechanical and engineering science. These scholarships are thirty in number, of $500 a year each, and tenable for three years by successful competitors in certain specified mechanical subjects.

Another Mathematical Prodigy.

An eleven year old boy, Jacques Inandi by name, is astonishing the French with his marvelous faculty of reckoning. He can neither read nor write. His calculating power appears to rival that of Jedediah Buxton, Henri Mondeux, Colburn, and others of the class.

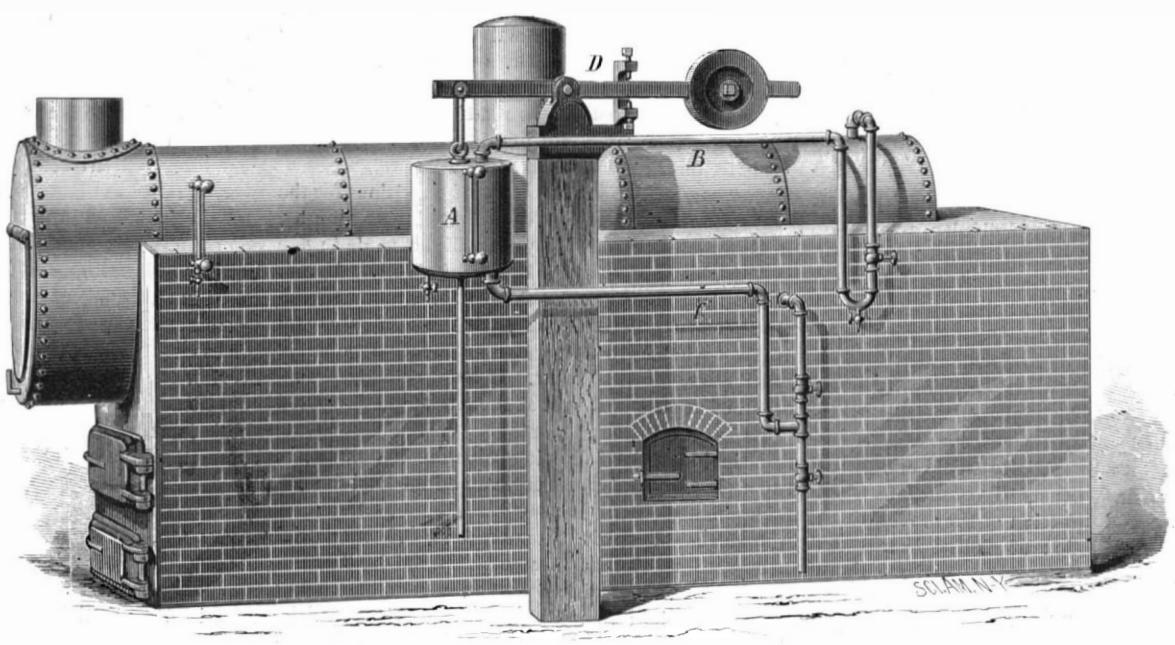
AUTOMATIC FEED WATER APPARATUS FOR STEAM BOILERS.

The annexed engraving shows an improved apparatus for regulating the supply of water fed to steam boilers. It operates by gravity of water contained in a movable tank connected with the boiler by two pipes, one above, the other below the water line. A rod connects the movable tank with the valve of a feed pump, or with the throttle valve of a steam pump, if a steam pump be used.

In the engraving, A is the tank, connected with the boiler by pipes, B C, the pipe, B, entering the boiler at the top or at any other convenient point above the water line, while the pipe, C, enters anywhere below the water line. The weight of the tank, A, and the water contained by it are supported by a weighted lever, D, which is adjusted so that, when the boiler is properly filled with water, the weight on the lever will be overbalanced, and the tank, A, will rest in its lowest position; but when the water level in the boiler is abnormally low the level of the water in the tank, A, is correspondingly lowered, and the tank is thereby made lighter, when the weight on the lever, D, preponderates and raises the tank, A. The movement of the tank, A, both up and down is limited by two screws in an arm projecting from the framework supporting the lever, D. The motion of the tank, A, is made available in regulating the amount of water supplied to the boiler by connecting the tank by means of a rod with a valve in the boiler feed pipe, or with the throttle valve of a steam pump, or with the valves of an injector, all depending, of course, on the particular method of feeding the boiler. When the tank rises it opens the valve and allows the water to flow into the boiler; when it descends the valve is wholly or partly closed, and the feeding is checked. By means of this device, the inventor says, the water level in a boiler can be perfectly maintained without special attention, and it makes no difference whether the water foams or is perfectly quiet, the weight of the water contained by the tank, A, is depended on, and not its seeming bulk. It is claimed that this device is far move reliable than gauge cocks or water gauges.

This device is supplied with valves by means of which it may at any time be blown off and cleaned. We are informed that one of these boiler feeders has been in use on a boiler in Red Wing, Minn., for the past ten months, and has been subjected to every possible test, and has proved reliable under all circumstances.

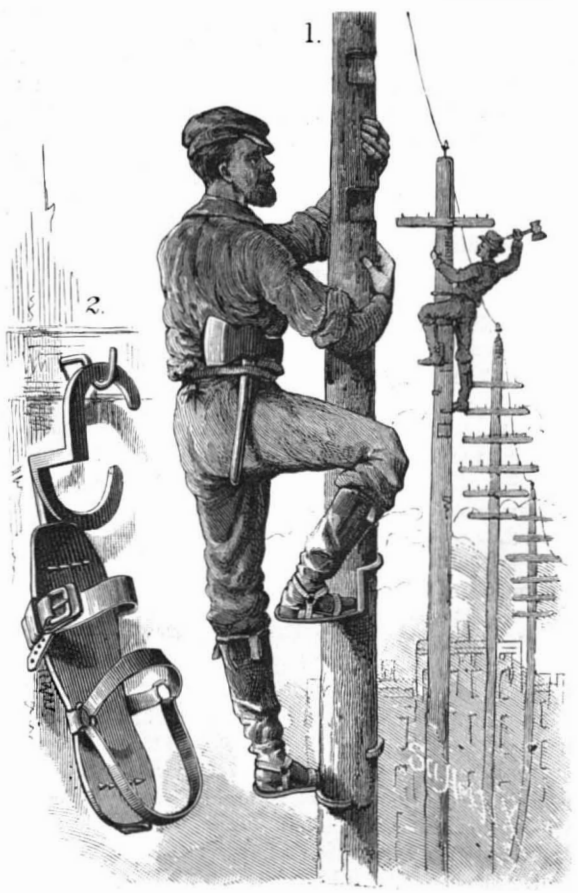
Further information may be obtained by addressing Mr. Henry Bergstrom, Red Wing, Minn.



BERGSTROM'S BOILER FEEDING APPARATUS.

CLIMBING APPARATUS.

A sailor is in his element when climbing to the top of a high mast, and experiences no more trouble in reaching the top of the mast than we do in going to the attic of our dwelling. Such gymnastic exercises are, however, not in the province of the engineer, and whenever he has to execute any work upon any object situated at a certain height, his



CLIMBING APPARATUS.

only means of ascending to it are by ladders or stages. The latter are, of course, only used where the expenses of such a structure may be incurred, and not at all suitable for reaching the top of ordinary poles or masts. In such a case ladders are generally employed, as being the only means available, but the lateral pressure upon any high post of a long and necessarily heavy ladder is very great, and its employment in such cases not devoid of danger. As nowadays telegraph poles are erected all over the country, and since the introduction of the telephone, often in situations difficult of access with a ladder, it becomes a matter of considerable importance to engineers to be able to reach the top of these posts with ease in order to be able to execute there the work which falls to their share, and upon the solidity and reliability of which very often many important matters depend. To facilitate the ascension of these posts a Swedish engineer has invented the climbing device shown in our illustration.

The principal part of the apparatus consists of a shoe attached to the foot—something in the manner of skates. It consists of an iron sole plate, which is attached by means of bolts and clips to a steel bar; to the sole are fixed the straps and rings, while the end of the steel bar is turned up at the end to form a cap. To the outer end of this bar two curved arms are hinged in such a manner that their points remain always a certain distance apart.

When the apparatus is to be used the soles are buckled to the feet of the operator, and there must, of course, be a pair of these apparatus with the curved arms set to opposite sides; the man then lifts one foot up after another by holding the foot so that the bar, shown while fixed in a vertical position, is thrown into a horizontal one; this enables the two curved arms to open and to encircle the post, when, by pressing the foot down, they will support the body. Thus one step after another may be taken until the arrival at the required height.

In order to give the operator steadiness, and to free the hands for the necessary work, the operator has a belt attached to his waist which also carries a ring which is capable of sliding along the post. By a simple adjustment the curved arms can be adjusted to the average diameter of the post to be ascended.—*Design and Work.*

NEW INVENTIONS.

Mr. Theodore Suppes, of Buffalo, Ill., has patented an improved washing machine, which is simple in construction, easily operated, and effective in operation, washing the clothes evenly, quickly, and thoroughly.

Messrs. Joel H. Prouty and Solon S. Sprague, of Worcester, Mass., have patented an improved burr-roll for loom temples, which consists of a hollow roll whose body and periphery are one, being formed of sheet metal, which is provided with triangular teeth formed by cutting V-shaped slits in the metal and striking up the pieces thus partly severed from the sheet, while the ends of the roll are provided with openings for insertion of fibrous packing material and of the lubricant for the bearings of the cylinder.

Mr. Rolla R. Jones, of Watertown, N. Y., has invented an improvement in pliers. The object of this invention is to furnish pliers so constructed that they may receive different tools, and that the heads can be removed and replaced as required.

Mr. George W. Terry, of Prescott, Ark., has patented a self-calculating register for postage stamps designed for use in fourth-class post offices, where a daily transcript of the number of stamps canceled has to be kept and forwarded to the department as a part of the quarterly returns, the use of which registers will save a great deal of time and labor in keeping the account.

Mr. Robert Cunningham, of New York city, has patented an improved process of manufacturing articles in imitation of papier mache, consisting in coating the surface of the article with transparent varnish, in then depositing thereon the ornament and allowing it to become fixed, and in then applying over the ornament and its support a covering of transparent varnish and allowing it to become dry.

A device for holding scrubbing, whitewash, and other brushes while in use, so as to permit the convenient and free manipulation of the brush, has been patented by Mr. Eugene B. Randolph, of East Millstone, N. J.

Dust Fires.

A gentleman at Appleton, Wis., communicates to the *American Miller* his experience, which shows, as we all know, that other kinds of dust besides flour are explosive under certain conditions. He says: The loft of my spoke mill, in this city, was wholly used as a finishing room, where the spoke was finished, and polished by contact with rapidly revolving sanded belts. In it was a square or box stove, used for warming purposes. The light, fine dust would accumulate in every crack and crevice of the room, requiring cleaning off every day. One day some of this dust was seen to fall from a rafter upon some live coals that had accidentally got out upon the hearth of the stove. Instantly there was a flash that filled the whole loft, and it was on fire in a hundred different places.

It was with the most active exertions that the fire was subdued, and not without a considerable damage to the building and stock. I believe the air was strongly impregnated with gas evolved by friction; and that the explosion and fire occurring in flour mills are precisely of the same nature and due to the same causes.

STRUCK BY LIGHTNING WHILE UNDER WATER.—At Halifax, N. S., May 29, while divers were at work at Cole Harbor dike a storm came upon them, and the lightning striking an air pump passed down to a diver under the water. When brought up he was insensible, but his injuries are not serious.

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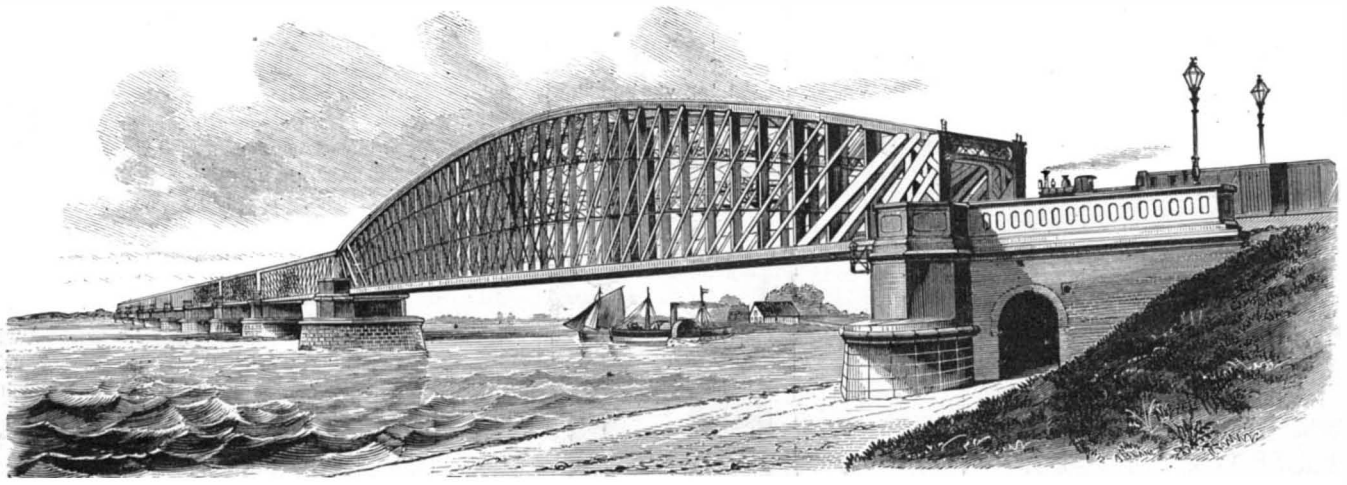
THE KUILENBURG BRIDGE.

The Utrecht Boxtel line of State railways in the Netherlands crosses three large rivers, the Lek, the Waal, and the Maas, within a distance of ten miles, the bridges at these points being known by the respective names of the Kuilenburg, the Bommel, and the Crèvecœur viaducts. The great lengths of these bridges, the nature of the streams that they cross, and the local circumstances necessitated engineering skill of a high class. The conditions of the foundations were such as to require piling. The piles varied from twenty-three to fifty-three feet in length, being driven in some cases by the ordinary pile-driving engine, and in others by a steam ram. After the piles were cut off to a level below water, the space between them was filled with beton or concrete, projecting from three to five and a half feet beyond the footings of the masonry above, and varying from eleven to twenty-one feet in thickness. The tops of the piles were completely floored over, and masonry built up, well bonded on to the floors to prevent sliding by longitudinal and cross walings of oak, and the faces of piers and ice-breakers were finished in Belgian ashlar. The footings of the piers were thoroughly protected by a close row of long piles to each, and heavy rip-rapping of rough stone.



BRIDGE AT KUILENBURG, DEPARTMENT OF THE NETHERLANDS.

The superstructure of the Kuilenburg bridge (shown in the engraving) was built by the well known Dutch firm of Harcort & Co., under the superintendence of Mr. N. T. Michaëlis, engineer-in-chief. It consists of nine spans, entirely of wrought iron construction, there being one span of 492 feet clear opening, one of 262 feet 6 inches, and seven of 187 feet each, making, with the widths of piers, a total length between the faces of abutments of 2,181 feet. The bridge consists of two open trusses, built of riveted plates and angles, the upper and lower flanges being formed in the shape of double Ts, side by side, the inclined ties of thin rectangular bars, except toward the centers of spans, where they require stiffening for compression under variable load, and the vertical struts of I-shape, some of the largest being strengthened by the introduction of two series of channel bars between the verticals. The trusses are placed so as to give a clear width of roadway of 27 feet, and height of 16 feet 5 inches, the structure being a *through* bridge. Cross girders 2 feet 11¼ inches deep connect the main trusses, and the whole is well stiffened by a thorough system of lateral and diagonal bracing. The span of 492 feet has a parabolic upper member, the depth of truss in center being 35·6 feet, and at the ends 26·24 feet. The other spans have rectangular trusses of the same depth as the ends of the parabolic truss.

All holes for riveting were drilled, no punching being allowed in the work. The bridge is built for double track, there being only a single track placed on at present. Two footpaths are provided for the service of administration. The total weight of material in the structure is as follows:

Wrought iron	4,394 6/10 tons.
Bessemer steel	610 5/10 "
Cast iron	30 "
Lead	3 2/10 "

There were also 8,000 cubic feet of oak, 9,500 cubic feet of timber used, and 350 tons of plates placed between them of fir to form the floor of the bridge. The total cost of the structure was upwards of $1,187,100.

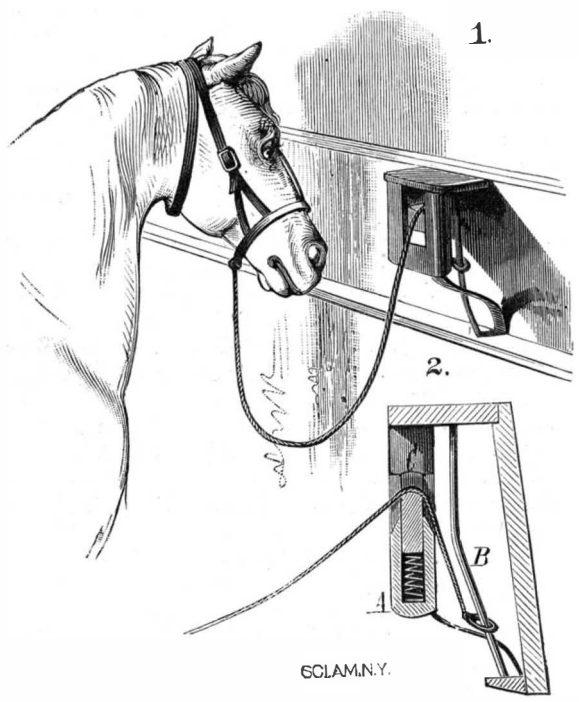
SAFETY APPLIANCE FOR RELEASING HORSES.

We give an engraving of a new safety device to be applied to the manger or some part of the stall to which horses are usually hitched. It consists in a device for cutting the halter should the horse become entangled in it.

Fig. 1 is a perspective view showing the exterior of the appliance, and Fig. 2 is a vertical section showing the arrangement of the several parts.

A hollow casting, A, is secured to the manger, and contains a spring-acted follower, C, which supports the halter and prevents it from coming into contact with the sharp edges of the casting, A, when no extraordinary strain is put upon the halter. The end of the halter is attached to a ring capable of sliding up and down on the rod, B. Should the horse become entangled so as to press down upon the halter, the follower in the casting, A, will be pressed down, allowing the halter to come into contact with the sharp edges of the casting and be instantly severed. It will be seen that so long as the halter fulfills its regular office it will not be cut, as the spring follower then holds it away from the cutting edges.

This invention was recently patented by Mr. Benjamin F. Strange, of Corvallis, Montana Ter.



STRANGE'S SAFETY HITCHING APPLIANCE.

SLED AND BOAT COMBINED.

The annexed engraving represents a novel gondola sled lately patented by Mr. James H. Dennis, of Newark, N. J. It is in reality a combined sleigh and boat, well adapted to both sleighing and boating purposes. Its construction will be readily understood from the engraving. The body or boat is similar in form to that of an ordinary row boat. It is provided with transverse seats, and may be made of sufficient size to contain several persons.

The sled is propelled by a set of sweeps arranged in rowlocks and operated like oars. The sweeps are slotted to receive the pins of the rowlocks, and the ends of the sweeps are provided with serrated steel ends or claws which engage the surface of the ice as the sled is propelled. When the device is used as a boat these serrated ends may be removed and paddle blades attached in their stead.

At the rear of the boat there is a wheel used for steering the sled on the ice, and it answers equally well for a rudder for the boat when it floats in the water. A brake is attached to the rear to retard the motion of the sled; it may also be used to assist in steering.

This gondola sled affords a means of enjoyable winter exercise which may be participated in by a party of persons, and no very great exertion is required to get up an astonishing speed on smooth hard ice. The double character of the sled renders it perfectly safe even on thin ice, as it answers the purpose of a boat as well as of a sled.

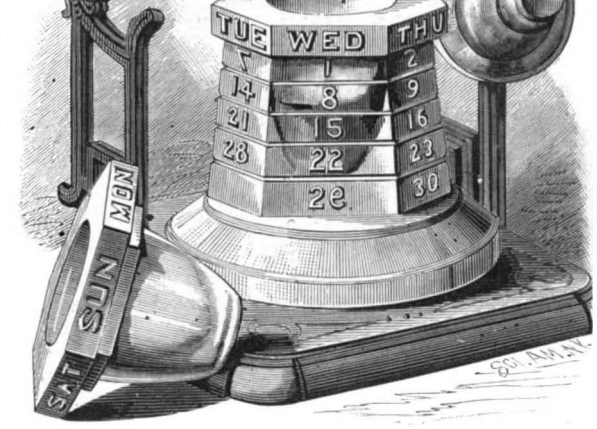
Further information may be obtained by addressing Mr. James H. Dennis, care of O. B. Wilson, 22 Cedar street, New York city.

DENNIS' GONDOLA SLED.

CALENDAR INKSTAND.

The engraving represents an inkstand provided with a calendar that requires changing but once a month to render it perpetual. It makes a handsome article of desk furniture, and as a calendar it is always in the right place. To change the adjustment is but the work of a moment; it is done by unscrewing a nut at the bottom of the stand, and turning the ink fount around until the days of the week are directly over the spaces containing the figures representing the proper days of the month. For example, if Tuesday is the last day of September, then Wednesday being the first day of October, the ink fount is turned until Wednesday is over the column beginning with figure 1. This useful article may be made either wholly of glass or partly of glass and partly of metal or wholly of metal.

For further information, address Mr. S. M. Howard, administrator, 1207 Main street, Wheeling, W. Va., and see advertisement in another column.



PERPETUAL CALENDAR INKSTAND.

THE result of the great English Derby race was cabled from London to New York in just twenty-five seconds. Tolerably quick work even for lightning.

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West Indian Fruits.

I remember a few years ago I was one of a party excursionizing down the Delaware. Our steamer passed an inward-bound schooner sailing up with a flooding tide, "wing and wing." The captain remarked, "There goes a fruiter," when everybody on deck rushed to the side to look at her. Doubtless, open-mouthed crowds, too, overlooked the unloading. How things have changed; here is one firm, Warner & Merritt, who keep twenty-six vessels busy bringing fruit to this port, three of them being steamers (and they talk of building more ships). So cargoes arrive almost daily.

Fruit is generally auctioned off at once upon arrival, if ripe; but if it needs maturing, it goes to the newly-finished warehouse nearly opposite, whose owners now have the satisfaction of having the finest building on the street, as well as the best appointed in the trade; a structure which has grown from small beginnings in so short a lapse of years, that the "trade" is just beginning to realize the fact of its existence.

Passing through the basement, or ground floor, by a devious path between barrels, boxes, and sacks full of oranges, nuts, dates, and what not, we went up to the offices on the second floor, as large and fine in appointments as those of a bank. Telephones to the top floor, to the wharves, to places all over town, to Cuba itself, possibly. A dozen clerks were busy with the multifarious details of the business.

Last week one of the firm was interviewed by a representative of one of the leading dailies with the following result:

"Now," he commenced, "is the opening of the active season. We expect a schooner to arrive on Monday from Jamaica with 6,500 bunches of bananas and 25,000 cocoanuts. In a few days a steamer will be due from Baracoa, Cuba, with 3,500 bunches of bananas and 50,000 cocoanuts."

"Are these bananas red or yellow?" was asked.

"The yellow bananas come from Jamaica and Aspinwall, and the red bananas from Cuba. The yellow bananas sell the best because they grow more to the bunch. A bunch of yellow bananas average about ten dozen, and sometimes they have as many as twenty dozen, while the red bananas seldom run over five dozen. The bunches are sold at about the same price, so the retailers can afford to sell the yellow ones for less and still make a better profit than they can on the red ones. So you see it is a difficult matter for us to sell red bananas when we have many of the yellow."

"Isn't the flavor of the yellow banana considered more delicate than that of the red?"

"By some people I believe it is. The flavor of a banana depends a great deal on the soil in which it is raised. Jamaica is the most favored in this respect; the bananas from Aspinwall are drier and not so rich. The Jamaica fruit is undoubtedly the best.

"We begin to receive pineapples from the Bahamas about the 1st of May, and the trade continues until the middle of July. In that time we receive over two millions of them. They are sold principally to canners and preservers. We shall send at least 300,000 to a canning establishment at Moorestown, N. J. Then the confectioners use a great many to make this candied fruit (glacé, I think they call it), and they consume more and more every year. Pineapples, in my opinion, make the nicest preserve there is."

"Is the demand good now?"

"Very good indeed," the importer went on. "When that shipment arrives we shall have to work a week night and day to get off the orders. We sell all quantities—fifty and a hundred bunch lots of bananas, case lots containing five bunches and even one bunch at a time. We send them all over the country. We very often make large shipments as far west as Missouri."

"Do you do much in California fruits?"

"Yes, in September we sell a good many California pears and grapes. We receive several car loads a week. The grapes, are, as a rule, very good, but I can't say as much for the pears."

"How is the consumption of dates and figs?"

"Very light. We don't sell many dried fruits, now that green fruits can be obtained at all seasons of the year."

"Is there any trade done in limes?"

"Yes, limes are imported later in the season. They are generally pickled or used for making punches. In Europe lime juice is made, and from that a very healthy drink, much preferable to lemonade. A good many are used in California, where they are sent from Mexico."

"May I trouble you to give me the rates fruits are selling for at present?"

"Certainly. Oranges bring from $3.75 to $4 per box; lemons from $4 to $5; bananas from $2 to $3.50 per bunch, according to size; limes from $6 to $10 a barrel of from 1,200 to 1,500; pineapples, this season, will wholesale at from $10 to $12 per hundred. These prices are about 25 per cent higher than those of last season, and the trade is active and steady. I never knew it to open better than it did this year."

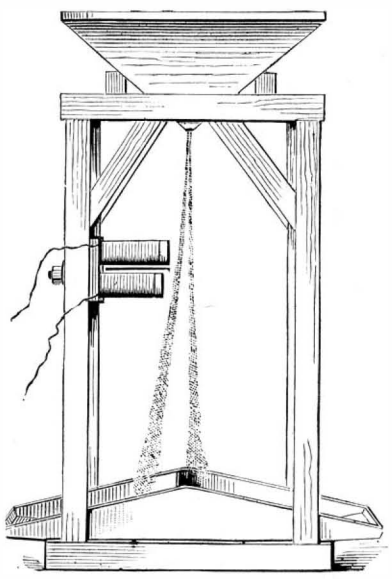
Stepping upon an elevator, we passed upward by one floor after another, each of which held its share of stock, to the top story, where cocoanuts were being desiccated at the rate of 150,000 per month. First leaving the hands of men who chop away the shell with hatchets, and going into the insatiate jaws of a machine which "chaws up" 100 in a minute. Then the snowy flakes are treated to a little sugar and kiln dried, lastly being packed into shapely tin cases bearing a label, "Gorton's Desiccated Cocoanut."

"We are working this department eighteen hours per day," said our guide, "and must shortly put on an all-night force to keep up with our orders."

We looked into the refrigerating rooms—warm in winter and cool in summer—where bananas, thousands of bunches, are forced to maturity, or retarded, at will.

EDISON'S ORE SEPARATOR.

We give herewith an engraving illustrating the principle of Mr. Edison's recently patented magnetic ore separator. The device is intended for working tailings which are now thrown away as being too poor to pay for working by any



EDISON'S MAGNETIC ORE SEPARATOR.

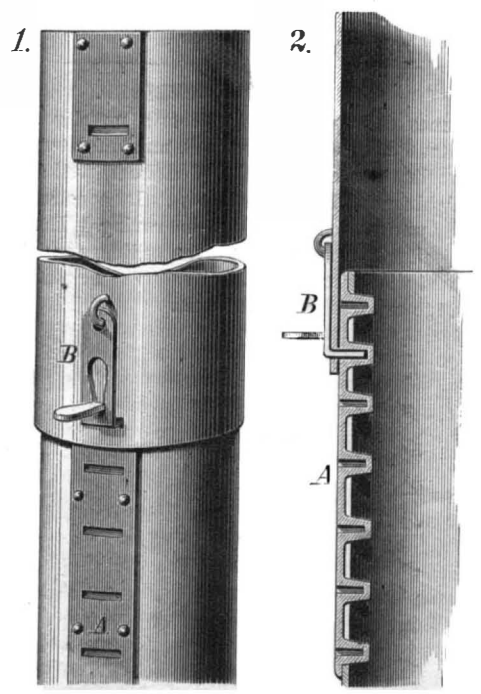
of the ordinary methods. The concentration is effected by allowing the sands to fall in front of the face of a large electro-magnet. The magnetic attraction changes the trajectory of the falling magnetic sand without stopping its fall, so that while the silicious sand, gold, and other non-magnetic substances fall straight down into one compartment of the receiving hopper, the trajectory of the magnetic sand is changed so that it falls into another compartment of the receiving hopper.

By this means the separation of the black sand is rapidly and completely effected with the expenditure of very little labor.

IMPROVEMENT IN STOVEPIPE.

We give herewith an engraving of an improvement in stovepipes, which will doubtless receive the approval of all who have had experience in joining and adjusting lengths of stovepipe. New pipe used in any place is scarcely ever right, and old pipe put in a new place is never right. The device shown in the engraving provides for lengthening and shortening the pipe and fastening it securely at any desired degree of extension.

The improvement consists in a cast metal plate, A, provided with a series of sockets, attached to a stovepipe length having a number of slots for receiving the sockets of the casting.



FREEMAN'S EXTENSION STOVEPIPE.

The sockets may be of any depth required to receive the tooth of a dog, B, hinged to the adjacent length of pipe. When the dog enters one of the sockets in the casting the two sections of pipe are firmly locked, and not liable to accidental separation.

This construction admits of any required change in the length of the pipe, and avoids all of the difficulties usually experienced in putting up stovepipe.

The inventor proposes to make the parts of either cast or stamped metal, or to stamp the recesses for receiving the dog, B, in the metal of which the pipe is formed.

Further information in relation to this useful invention may be obtained by addressing the inventor, Mr. W. C. Freeman, Fort Reno, Indian Territory.

Rules for the Management of Steam Boilers.

Engineers and users of steam power will be benefited by keeping in constant mind the following rules which the Hartford Steam Boiler Insurance Company keep posted in the boiler rooms where they have assured risks:

1. *Condition of the Water.*—The first duty of an engineer, when he enters his boiler room in the morning, is to ascertain how many gauges of water there are in his boilers. Never unbank nor replenish the fire until this is done. Accidents have occurred and many boilers have been entirely ruined from neglect of this precaution.

2. *Low Water.*—In case of low water, immediately cover the fire with ashes; or, if no ashes are at hand, use fresh coal. Do not turn on the feed under any circumstances, nor tamper with nor open the safety valve. Let the steam outlets remain as they are.

3. *In Case of Foaming.*—Close the throttle, and keep closed long enough to show true level of water. If that level is sufficiently high, feeding and blowing will usually suffice to correct the evil. In case of violent foamings, caused by dirty water, or change from salt to fresh, or *vice versa*, in addition to the action above stated, check draught and cover fires with fresh coal.

4. *Leaks.*—When leaks are discovered, they should be repaired as soon as possible.

5. *Blowing Off.*—Blow down, under a pressure not exceeding twenty pounds, at least once in two weeks; every Saturday night would be better. In case the feed becomes muddy, blow out six or eight inches every day. Where surface blow-cocks are used, they should be often opened for a few moments at a time.

6. *Filling up the Boiler.*—After blowing down, allow the boiler to become cool, before filling up again. Cold water pumped into hot boilers is very injurious, from sudden contraction.

7. *Exterior of Boiler.*—Care should be taken that no water comes in contact with the exterior of the boiler, either from leaky joints or other causes.

8. *Removing Deposit and Sediment.*—In tubular boilers the hand holes should be often opened, and all collections removed from over the fire. Also, when boilers are fed in in front, and blown off through the same pipe, the collection of mud or sediment in the rear end should be often removed.

9. *Safety Valves.*—Raise the safety valves cautiously and frequently, as they are liable to become fast in their seats and useless for the purpose intended.

10. *Safety Valve and Pressure Gauge.*—Should the gauge at any time indicate the limit of pressure allowed by this company, see that the safety valves are blowing off. In case of difference, notify the company's inspector.

11. *Gauge Cocks, Glass Gauges.*—Keep gauge cocks clear and in constant use. Glass gauges should not be relied on altogether.

12. *Blisters.*—When a blister appears there must be no delay in having it carefully examined and trimmed, or patched, as the case may require.

13. *Clean Sheets.*—Particular care should be taken to keep sheets and parts of boilers exposed to the fire perfectly clean; also, all tubes, flues, and connections well swept. This is particularly necessary where wood or soft coal is used as fuel.

14. *General Care of Boilers and Connections.*—Under all circumstances keep the gauges, cocks, etc., clean and in good order, and things generally in and about the engine and boiler room in a neat condition.

Ocean Icebergs.

During a recent passage of the steamer Helvetia from Antwerp to New York, the wind blowing a nice breeze from the westward, a sudden change in the temperature was noticed. An hour before the weather was quite sultry, awnings being spread fore and aft; but at about three o'clock in the afternoon, although the sun was shining brilliantly, a cold blast from the northwest set it. The rapidity of the change from a sweltering summer's day to an Arctic frost naturally caused considerable amazement, especially among the greener members of the crew. The more experienced knew what was coming, and when the cry of "Icebergs on the starboard bow!" followed immediately by the notification that others were visible on the port side, the mystery was explained. Then, right in the track of vessels were seen monstrous mountains of ice, some of them pure white, others crossed in many directions by broad stripes of blue. Some of them were 200 feet high and 1,000 feet long. There were at least thirty of them, extending for many miles.

The sea broke against them, forcing torrents of spray up the steep acclivities of their sides. The rays of the sun had melted the upper parts of many of them into the most fanciful shapes, and imaginary likenesses of crags, cliffs, and castles could be traced in those parts more exposed to the lines of the heat. Streams of water in picturesque cascades were flowing down into the sea, and the huge, majestic masses seemed to be moving slowly to the southeast. The Helvetia passed near enough to several of them to distinguish plainly the noise of the waves as they broke against the rugged sides of the bergs. As night closed in and the moon arose the sight was indeed beautiful.

The British steamer Altmore, from Liverpool, also encountered a number of icebergs, probably the same the Helvetia met with. Her commander, Captain Watson, describes one as being a mile long and 200 feet high.

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SOME EXPERIMENTS WITH SMALL BATTERIES

M. L. BAXTER, M.D.

To illustrate the capacity and sensitiveness of the telephone, I tried a small battery made in a common tumbler with a carbon and zinc pair, and a solution of ammonium muriate as an excitant. The common sal ammoniac will answer all purposes.

This battery I included in a circuit with a Hughes microphone and a telephone; and instead of the monotonous ticking of a watch or clock, I used a musical watch with quite a range of tone. By the use of this watch the capacity of the microphone for transmitting high or low tones with their complementary overtones may be studied and regulated

With the battery above described I obtained all the tones clearly and well, and tried with it what effect different depths of immersion would have. One of the claims in Professor Bell's first patent on undulatory currents covers varying immersion as a means of varying the current, but I found very little difference in the operation of the telephone when the carbon plate was withdrawn so that nearly a corner touched the surface of the liquid in the battery. This led to the withdrawal of the zinc plate also, until only its corner touched the liquid. Under these circumstances the diminution in volume of sound was very slight, the tune coming out full and clear. The zinc plate being held clear of the solution a dead silence resulted, and the transition from this to full tone ensued with the slightest possible contact.

These phenomena led me to construct very minute batteries, and the progress step by step was very interesting. One arrangement of a pair shows the battery in, to me, a new light. It is this: Make up a circuit of a microphone, a telephone, and a continuous copper wire, and, of course, there is silence in the telephone. Cut the copper wire, and to one of the ends attach a bit of zinc. Bring the ends together again and silence ensues as before; but allow the hundredth of an inch clear space to intervene and bridge the gap with a drop of battery solution, and the telephone at once finds its voice, not loud, to be sure, but clear and distinct for most of the notes.

Such a "battery" as this may be even concealed in the connecting wire by being covered by the usual cotton or silk insulating covering, two or three thicknesses of tissue paper between the ends preventing metallic contact. A gun cap battery with zinc and sulphuric acid gives a strong current for the microphone circuit.

Discarding the zinc, as being too readily consumed, I have made pairs with carbon and gold, carbon and platinum, platinum and gold, etc., and in no case have I failed in getting results; but the currents are too weak for practical uses. Two pieces of carbon, even, have difference enough in their structure to determine a slight current appreciable by the telephone. The study of these combinations, though not of apparent importance, is interesting, and, where all are groping, may shed a ray of light upon something else.

Washington, D C., June, 1880.

New Process of Simultaneous Color Printing.

Many have been the attempts so to combine the various pigments required for a polychrome print, as to reproduce them by a single impression, but the different densities and consistency of the pigments employed has hitherto found an obstacle to this desirable result. Mr. W G White, a member of the Society of Arts, has, after much time spent in experimenting, succeeded in forming such a combination of various chemicals with the colors he employs, as to render them, not only of uniform consistency, but also of the requisite hardness for the operations of cutting and combining to form the pattern desired. The prepared pigment chosen for the ground of the design is first run into a mould, so as to form a solid block about three inches thick. The pattern is traced with a steel point upon a sheet of artificial talc, made with a mixture of collodion and oil, and this is pressed upon the block, so as to leave an impression of the lines upon its surface. The pattern is then cut out of the block by a sharp steel knife mounted on the end of an articulated parallelogram, so as to be maintained in a vertical position, while at the same time having a perfectly free horizontal motion. The various pigments forming the design are then poured into the spaces cut out, a kind of mould being formed temporarily by a portion of the ground color, supplemented by strips of wood soaked in water. The paint is poured in hot and liquid, and, as soon as it has cooled, another is added, and so on, until the whole design is finished, thus forming a complete mosaic. In the case of a large subject, various portions of the block may be executed by different operators at once, and then joined together; the method is also being tried, with every prospect of success, of cutting out the whole pattern in wood or metal, by means of a band saw, and then forcing the die so formed into the block of ground color, so as to stamp out the color therefrom. The mosaic, or "type," as it is called, is put into a powerful press, resembling that used by lithographers, and is first shaved by a heavy steel knife, so as to render the surface perfectly flat, level, and smooth. The material to be printed upon is then laid face downward on the slightly moistened block, and a series of rollers are passed over it once or twice, when the impression is found to have completely penetrated its substance. The print is exposed for a few seconds to the heat of a hot plate, for driving off the solvents employed, and perhaps fixing the colors, which are now found to be printed so permanently that they will stand exposure to the sun, and wear only removes them in measure as the substance itself is worn away. As a crucial test, a piece of velvet printed in this manner has been boiled for eight hours in strong potash solution, when it was found that the color had not entirely disappeared. Water color drawings and oil paintings may be reproduced by this process, so as to present the appearance of chromo-lithographs and oleographs respectively. But there is a far more extended application, in printing upon textile fabrics the designs of Gobelins and Arbusson tapestry, to form curtains, *portières*, etc. The range of materials capable of being treated appears to be very extensive, as the writer saw the same design reproduced upon fine silk and the coarsest jute sacking, both impressions presenting all the necessary sharpness of outline. This process is now worked upon quite a commercial scale, and steam and hydraulic plant is being put up at Passy, Paris, to meet the demand created for cheap reproductions of artistic designs.

Lecture Experiments.

BY R. H. RIDOUT, F.C.S.*

EXPERIMENT SHOWING COHESION IN LIQUIDS.

A shallow tray, 6 inches by 2 inches, open at one end, and lipped, is supported on three leveling screws, the lipped end being slightly higher than the other. A quantity of mercury, placed in the tray, falls to the lower end, but if now a little more be added to make it flow over the lip, the cohesion is such as to enable the descending stream to drag the remainder up the inclined plane. Water gives similar results; but from the difficulty of getting a surface which will long remain unwetted, the results are not so satisfactory.

APPARATUS FOR SHOWING ELECTROLYSIS OF WATER.

A glass bottle of 30 or 40 oz. capacity is stopped with an India-rubber cork, carrying two glass tubes, which contain hermetically-sealed platinum wires, projecting an inch at the inner side, and terminating in binding screws at the other. The vessel is filled one-fifth full of acidulated water, boiled, and the stopper inserted to cause a vacuum when cold. On connecting with two "Grove" cells, the bubbles of gas so expand as to make the whole liquid appear to boil. With either a single Grove, Bunsen, bichromate, or Leclanché cell, continuous decomposition may be obtained. When sufficient gas has collected to impair the vacuum, it may be restored by boiling.

APPARATUS FOR SHOWING ABSORPTION OF HEAT ON LIQUEFACTION OF SOLIDS.

In a differential air thermometer the usual flasks are replaced by others which have had their bottoms softened, and then introverted to form a cup or basin. In this latter water is placed, and the solid then added. Any change in the liquid's temperature is at once communicated to the air space round the cup.

PRODUCTION OF A MUSICAL NOTE IN A CONTINUOUS TUBE.

In most wind instruments the sound results either from the movement of a solid body, or the air has the choice of two directions, which it alternately takes. I find, however, that it is possible to produce a good note from a tube one-quarter inch to five-eighths inch in diameter, and from six inches to a foot long, and having a part of it contracted smoothly and evenly to about a fourth of its diameter, by blowing through it If the tube be bent upon itself at the point of contraction, the sounds are more readily obtained, though not of greater intensity.

The Heliograph.

The London *Daily News* states that they have to thank the heliograph again for an important message received from General Stewart, and announcing the result of an attack on the British troops, in which the enemy seems to have suffered severely. The message is dated Camp Ghuzni, April 22, and was received at the India Office the following day It is very probable that the news could not have been brought so speedily by electric telegraph. The heliograph does not require the route to be kept open. The line of communication cannot be cut, for the simple reason that the signaling takes place over the heads of the enemy, and the stations required are but few and far between. A ten inch mirror, and this is the diameter of the ordinary field heliograph, is capable of reflecting the sun's rays in the form of a bright spot, or flare, to a distance of fifty miles, the signal at this interval being recognizable without the aid of a glass. That is to say, two trained sappers, each provided with a mirror, can readily speak to one another, supposing the sun is shining, with an interval of fifty miles between them, provided their stations are sufficiently high and no rising ground intervenes to stop the rays. The adjustment of the military heliograph is a very simple matter. An army leaves its base where a heliograph station is located, and after traveling some miles desires to communicate with the stay-at-homes. A hill in the locality is chosen, and a sapper ascends with his heliograph, which is simply a stand bearing a mirror swung like the ordinary toilet looking glass, except that besides swinging horizontally it is also pivoted so as to move vertically as well. Behind the mirror, in the very center, a little of the quicksilver has been removed, so that the sapper can go behind his instrument and look through a tiny hole in it toward the station he desires to signal. Having sighted the station by adjusting the mirror, he next proceeds to set up in front of the heliograph a rod, and upon this rod is a movable stud. This stud is manipulated like the foresight of a rifle, and the sapper again, standing behind his instrument, directs the adjustment of this stud until the hole in the mirror, the stud, and the distant station are in a line. The heliograph is then ready to work, and in order to flash signals so that they may be seen at a distance, the sapper has only to take care that his mirror reflects the sunshine on the stud just in front of him.

* Papers read before Physical Society.

Collodion as a Generator of Electricity.

Professor Guthrie has some time since utilized the mixture of collodion and India-rubber for this purpose, and also given it a wider scope. As regards electricity, it is very remarkable that if you rub glass with the sheet of India-rubber and collodion, negative electricity is excited, where, ordinarily speaking, positive electricity is generated. One of the applications the Professor has given to this collodio-caoutchouc is the formation of miniature balloons for experimental purposes. An ordinary glass flask is first coated inside with collodion by rolling the liquid round and round inside. When dried, a layer of India-rubber is given to the collodion in the same way, and then another layer of collodion, and so on, till four or five thicknesses of collodion are reached. When dried the film is easily detached by lifting it at the neck of the flask, and pouring between it and the glass a little acidulated water. The balloon then comes out perfectly well shaped, and ready to be filled with any gas which it may be desired to try, and the neck is well secured by waxed silk or any other suitable means. In experimental physics there seem to be many useful applications of this medium, and no doubt it will come into use.

It may be used, says the *Photographic News*, to tie down the stoppers of bottles; and here its pliability is of great service, as there is none of that disagreeableness in opening a stoppered bottle which has been tied down with ordinary bladder. Photographers have before now brought into prominence some properties of different materials whose value had not been previously recognized. What would the German army, for instance, have done without the gelatine films made insoluble by exposure to light in presence of bichromate of potash? Their everlasting sausages would have had a hard time of it.

How the Waste of the Body is Thrown Off.

At a recent meeting of the Griffith Club of Microscopy (Detroit), the fascination of microscopical study was well illustrated by the demonstrations of Prof. Chas. H. Stowell, of Michigan University. Demonstration number one was upon epithelial cells, which he produced from the side and roof of his mouth with a "poetical" movement of the tongue, and deposited upon a glass slide, to all appearance, a drop of saliva. Skimming the air bubbles from the top with a pin, and removing the surplus saliva with a piece of blotting paper, he added a drop of staining fluid to better define the cells, and placing it under a microscope exhibited a multitude of thin, transparent scales, each about one five-hundredth of an inch in diameter, and containing a nucleus in the center. This he asserted was the form in which a large part of all bodies wasted, being thrown off through perspiration constantly. Demonstration number two was of glandular epithelial cells, from the scrapings of the liver of an ox, much smaller, but similar in some respects to those previously shown. Demonstration number three was of cells from the mucous membrane of the roof of a frog's mouth, which exhibited the extraordinary action of the cilia. These cells were fringed with hair-like protuberances, styled cilia, that moved with great activity and regularity, and seemed endowed with separate organic life and intelligence. The professor asserted that these cells were very common in the human body, noticeably in the bronchial tubes, where the cilia, moving always in one direction, were active in throwing off foreign substances injurious to health. Demonstration number four was of the circulation of blood in the feet of several frogs, rendered insensible by an injection of woorara.

One of the most noticeable features of the evening was the exhibition and use of twenty Ann Arbor frogs, which the professor brought with him as scientific curiosities, stating that they were a distinct variety peculiar to Ann Arbor, and of great rarity, possessing a most curious and interesting resemblance to the human body in one or two respects. Apologizing to the ladies present for so doing, the professor gathered the thirty gentlemen present at one side of the room and exhibited the distinguishing characteristics to them.

The Chulafinne Meteorite.

The analysis of the Chulafinne, Alabama, meteorite, described in our issue for May 6 last, shows the following elements:

Iron	91·608
Nickel	7·368
Cobalt	0·500
Phosphorus	0·170
	99.646

This analysis, made by J. B. Mackintosh, E.M., of the Columbia College School of Mines, is furnished by Mr. W. E Hidden.

The Millers' Exhibition.

Most gratifying reports are given with regard to the character, attendance, and promise of the Millers' International Exhibition, which was opened in Cincinnati, Ohio, May 31. In the variety and value of its exhibits it fully justifies the large expectations of its friends and promoters, and there is every reason to anticipate great national benefits to flow from it. The Exhibition will continue through June.

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AMATEUR MECHANICS.

GLASS ENGRAVING.

One of the simplest and easiest operations possible with a foot lathe is that of glass engraving. The tools—aside from the lathe, which every amateur is supposed to possess—are simple and inexpensive, and only a little practice is required to attain a fair efficiency in the art. Any foot lathe will do if it is provided with a drill chuck. The copper disks used in engraving may be readily adapted to the lathe by fitting a spindle to the drill chuck, and attaching the copper disk or wheel to the spindle by means of an ordinary machine screw tapped into the end of the spindle. It is best to have a spindle for each copper disk or wheel, although it is not absolutely necessary except in the case of the very smallest.

The amateur should supply himself with at least a dozen wheels of different diameters and thicknesses. Some of them should be from two and a half to three inches in diameter, and from one thirty-second to one eighth inch thick; others one inch in diameter and from one thirty-second to one quarter inch thick; also several about one half inch in diameter and of different thicknesses. He should also have some very small ones, say from one eighth to one quarter inch in diameter, and from one sixty-fourth to one quarter inch thick. The very small wheels are best formed on the end of a soft iron rod fitted to the drill chuck. Some of the wheels may be convex on the edge, some beveled, and some of them may be straight across or cylindrical. Pieces of copper tube of different sizes and thicknesses are also very useful in cutting circles in some kinds of work.

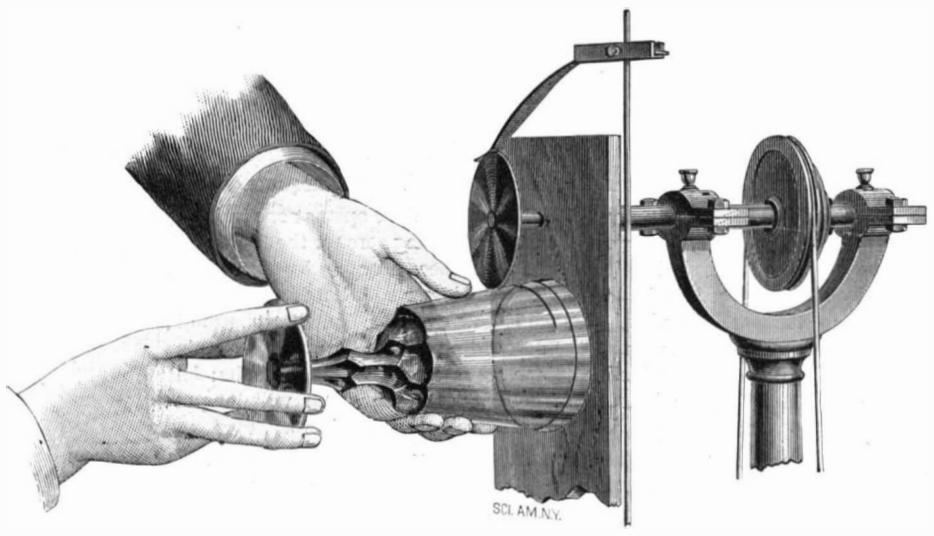

FIG. 1.—GLASS ENGRAVING, LINING.

The engraving shows a polishing lathe head in use for this purpose, but any lathe having sufficient space between the spindle and the bed will do, and if this space is insufficient the lathe head may, in most cases, be raised upon blocks to give all the space required.

A rod extending upward from the lathe bed supports a thin metal strip that rests on the top of the wheel and prevents the abraiding material from flying in the face of the operator.

The first lesson for the amateur will be that of engraving either thin or wide lines around a goblet or other vessel, or along the edges of a pane of window glass. The method of arranging the lathe and holding the work is so clearly shown in Fig. 1 as to scarcely require a word of explanation. A wooden gauge is placed behind the cutting wheel to gauge the distance of the line from the edge of the vessel. This being done, a little washed flour emery, mixed with olive oil is applied to the periphery of the wheel, the latter being revolved at a moderate speed. Now, by pressing the goblet against the gauge, and at the same time holding it lightly against the wheel and turning it slowly, a line will be formed around the goblet. As soon as the wheel ceases to cut well it should be again supplied with emery and oil. A few lines of this kind along the edges of a pane of glass give it an elegant appearance. The only necessary precaution is to have the edges of the glass perfectly straight and smooth. If it is otherwise, a piece of wood having a slit sawed in it for receiving the edge of the glass may be put on the edge of the glass temporarily to guide it.

The operation of cutting letters, vines, and other ornamental work is somewhat difficult at first, but with practice it soon becomes easy. The design is first drawn with a mixture of gum water and whiting, by means of a pen or small brush; the lines are then followed by the appropriate wheel charged with emery flour and oil. The matter of choosing the proper wheel for a certain kind of work must be left entirely to the operator, and he must get the most of his knowledge by practice if he has no opportunities for observation.

The smaller wheels will naturally be used for small work and for short curved lines, while the larger wheels will be used in making large curves and straight lines. Should it be desirable to polish the engraved work the operator will use lead wheels, applying pumice stone and oil.

Gems are engraved in much the same way as glass, the difference being that iron wheels and diamond dust are used instead of copper wheels and emery. The lathe should be fine and the tools very small. The polishing will be done with putty powder or rottenstone and oil. M.

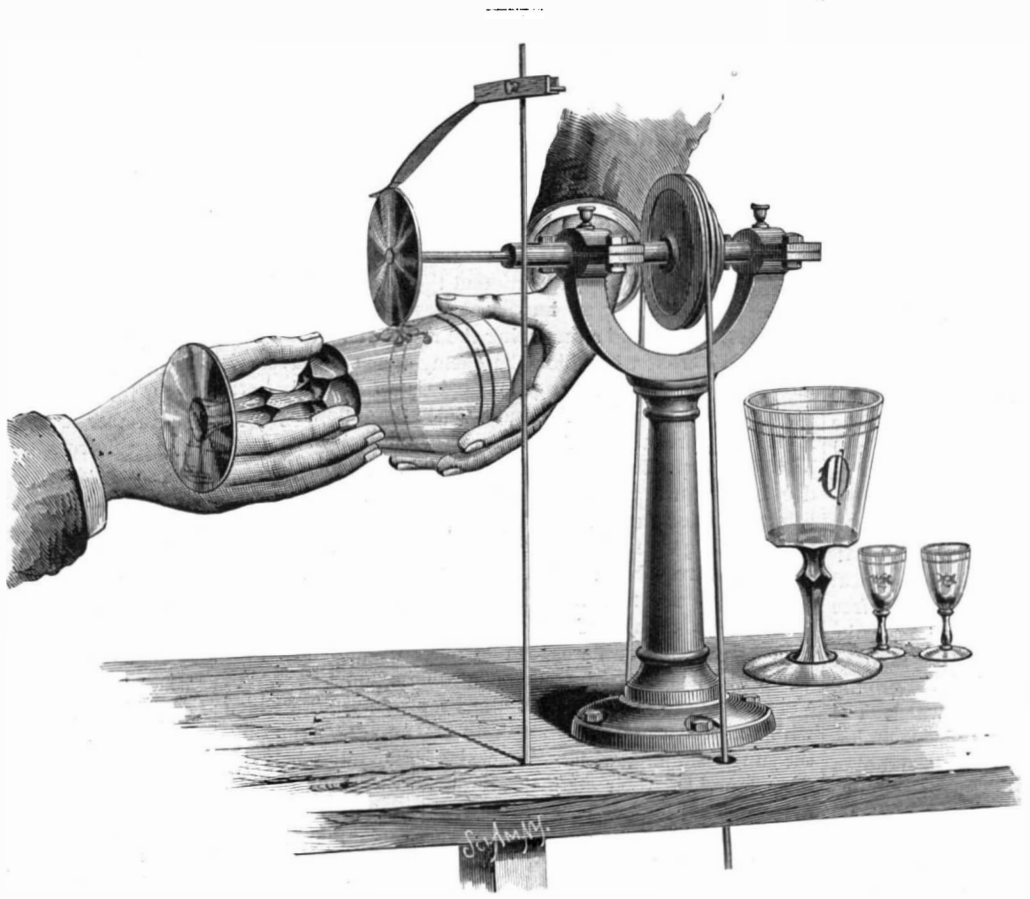

FIG. 2.—GLASS ENGRAVING, LETTERING.

MISCELLANEOUS INVENTIONS.

Mr. Orlo H. Drinkwater, of Cedar Point, Kan., has patented an improved grain car door fastening, which consists of a quickly adjustable fastening formed of a horizontal arm jointed in the jamb of the car door about the level of the top of the door when the latter is down, which arm is provided with a vertical screw tapped through a hole in the extremity of the arm and carrying below a foot which rests upon the top of the car door. When the screw is tightened clamps the door tightly down to its place, the arm being capable of being swung into the plane of the door when the latter is to be fastened, or turned outwardly at right angles when the door is to be opened.

Mr. Theodore Nuthmann, of Brooklyn, N.Y., has patented an improved spring-soled boot and shoe. The object of this invention is to furnish spring-soled boots and shoes, so constructed as to give the spring more freedom of movement, give more elasticity to the boot or shoe, better support the foot, and prevent the sole from spreading, as it is liable to do when the spring is inserted in the usual way.

Mr. William A. Warren, of Princeton, Ill., has patented a valve for water pipes for supplying a constant and self-regulating flow of water in troughs that are designed for watering stock. The invention consists essentially of a long arm hinged to the end of the water supply pipe, and having its free end connected to a float that rises and falls with the rise or subsidence of the water in the containing vessel, and thereby operates the arm, so that it will admit or cut off the flow of water through the supply pipe, the opposite faces or ends of the said supply pipe and arm being cut obliquely for the better working of the valve or arm within a limited space.

Mr. Enos Peters, of Appleton, Ohio, has patented a harness clamp so constructed as to clamp tugs and other long straps of harness for their whole length, and hold them securely while being stitched, trimmed, and dressed.

Mr. Emile F. Pernot, of Bowling Green, Ohio, has patented a device adapted especially for printing addresses. The invention consists of a galley or form of type made to slide intermittently in a box or case beneath a transverse slot in the cover of the said case by the action of a lever and pawl, while the same motion of the lever causes a plunger to press a strip of paper through the slot in the top of the box upon the type beneath it.

Mr. John A. Carter, of Rose Bud, Ill., has patented an improvement in the class of musical instruments wherein hammers are employed to strike upon wires or other resonant bodies arranged in any usual manner, and the movement of the hammers obtained by a perforated music sheet that is fed by a crank.

Mr. Samuel M. Wright, P. O. Box 469, Rochester, Fulton county, Ind., has recently patented an improved rein holder arranged for convenient attachment to any dashboard, and it is made adjustable as to height.

Mr. Samuel Herzberg, of Pontiac, Ill., has lately patented an improved tag or ticket holder which is very simple in its construction and well adapted to the purpose for which it is intended.

Mr. Lewis Morse, of North Attleborough, Mass., has patented an improvement in connecting the shank of the button with the top; and the object of the improvement is to facilitate the application of the button to the cuff or other object and the fastening of the two parts thereof together. The invention consists in a button made in two parts and provided with a single wire spring having its ends sheathed in opposite tubes, of which one is movable and the other rigid, opposite bends of the wire being carried under the rim of the button.

Bertha Schleifer, of New York city, has patented an improved hook and eye fastener. This invention consists in securing hooks and eyes to strips of fabric (designed to be attached to a dress waist) by means of clasps or clamps.

Mr. Thomas L. Clacher, of New York city, has patented an improved box for containing pamphlets, magazines, manuscripts, and the like articles.

An improved harvester reel, patented by Mr. William H. Akens, of Penn Line, Pa., is provided with a simple and convenient device for gathering cut grain into gavels. The invention consists of a circular plate fixed upon one of the standards and having a journal of the axle passing centrally through it, and having fixed on its inner face two segmental cams, with which the D-shaped pieces engage as the device is revolved, and thereby cause the rakes to move on their hinges, as is desired.

Mr. Michel Sichel, of Cape Girardeau, Mo., has patented an improved fire escape ladder which consists of an adjustable windlass, by which the ladder may be extended and the suspended platform be elevated and lowered.

Mr. Lewis Morse, of North Attleborough, Mass., has patented an improved method of uniting glass and enamel to metal. The object of this invention is to provide a cheap and simple method whereby, in the manufacture of buttons, studs, and other ornamental articles of jewelry and dress that consist partly of glass, enamel, or cement, the glass, enamel, or cement portions may be readily and firmly united to the metallic parts.

Mr. Albert S. Robinson, of Albany, N.Y., has patented a heel stiffener and counter support. This is a metallic device applicable to any boot or shoe heel for stiffening the heel and supporting the counter, and it consists in a plate formed with a flat head for bearing on the counter, a flange at the opposite end to rest beneath the heel, and a tongue intermediate of the ends, for entering the upper portion of the heel. The device is secured by a screw passed upward through the bottom flange and through the tongue, so that the heel is clamped between the flange and tongue.

Mr. Richard Himes, of Elizaville, Ky., has invented an improved bee hive. It is so constructed that the surplus honey can be easily and conveniently removed without disturbing or exciting the bees. It will allow the swarming of the bees to be controlled, and it can be easily arranged to form a warm and dry wintering hive.

An improved combined cotton scraper and chopper has been patented by Mr. Lorenzo D. Bowman, of Beebe Station, Ark. The object of this invention is to furnish combined cotton scrapers and choppers so constructed that the operating implements will be fully under the control of the driver, and may be adjusted to work at any desired depth in the ground.

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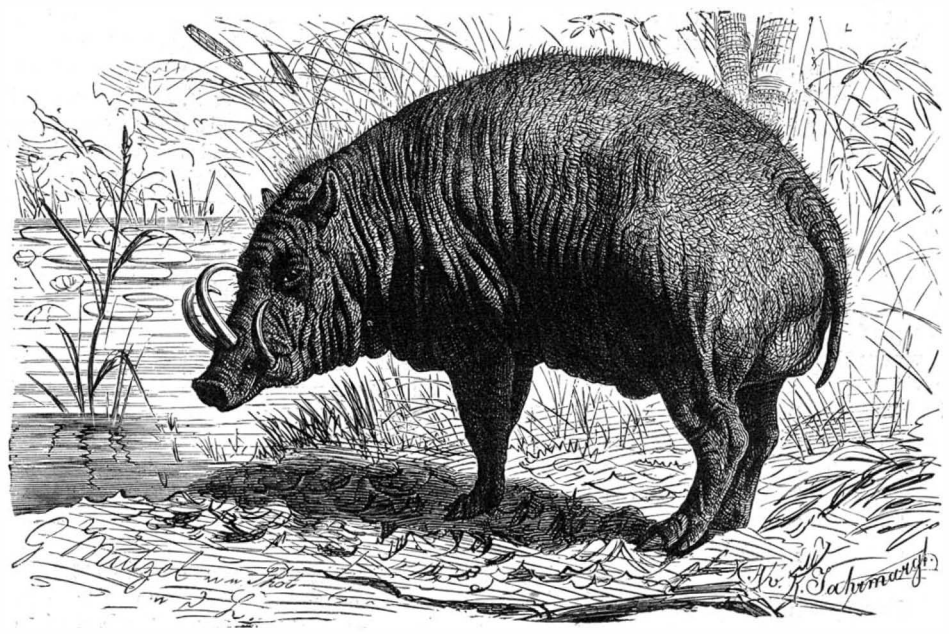
THE BABYROUSSA OF MALACCA.

This strange creature is notable for the curious manner in which the tusks are arranged, four of these weapons being seen to project above the snout. The tusks of the lower jaw project upward on each side of the upper, as is the case with the ordinary boar of Europe, but those of the upper jaw are directed in a very strange manner. Their sockets, instead of pointing downwards, are curved upwards, so that the tooth, in filling the curvatures of the socket, passes through a hole in the upper lip, and curls boldly over the face. The curve, as well as the comparative size of these weapons, is extremely variable, and is seldom precisely the same in any two individuals. The upper tusks do not seem to be employed as offensive weapons; indeed, in many instances they would be quite useless for such a purpose, as they are so strongly curved that their points nearly reach the skin of the forehead. The female is devoid of these curious appendages.

From all accounts, the babyroussa seems to be a very fierce and dangerous animal, being possessed of great strength, and able to inflict terrible wounds with the tusks of the lower jaw. A naval officer who had experienced several encounters with this creature, spoke of it with great respect, and seemed to hold its warlike abilities in some awe. The adult male babyroussa is considerably larger than the boar of England, and the officer above mentioned told me that he had seen them as large as donkeys. It is a very good swimmer, and will take to the water for its own gratification, swimming considerable distances without any apparent effort.

The skin of the babyroussa is rather smooth, being sparsely covered with short, bristly hairs. The object of the upper tusks is at present unknown, although certain old writers asserted that the animal was accustomed to suspend himself to branches by means of the appendage. The babyroussa lives in herds of considerable size, and is found inhabiting the marshy parts of its native land.



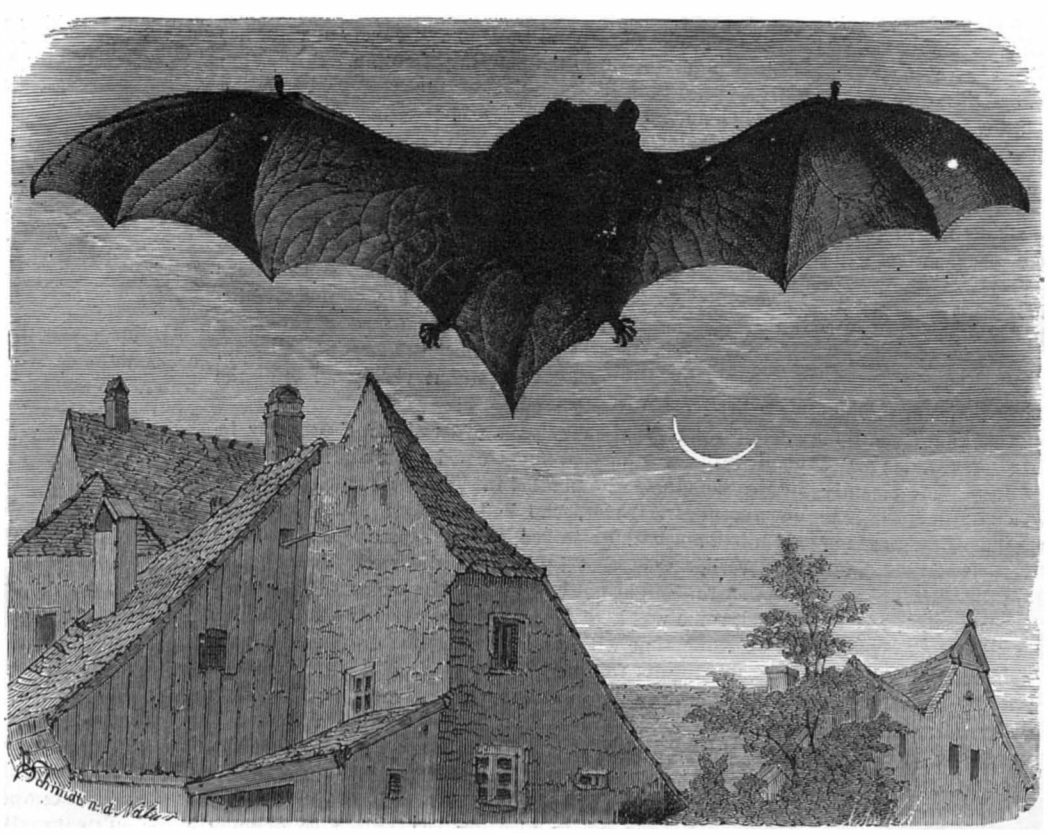
THE BABYROUSSA.—(*Babirussa Alfurus.*)

THE BARBASTELLE.

The barbastelle does not seem to be very plentiful in this country, nor in England. One of these animals, which was for some weeks in possession of Mr. Bell, was taken in Kent, says Wood's *Natural History*, at the bottom of a mine seventy feet in depth. It did not seem to be so active as some long-eared and other bats which were taken in the same locality, and preferred lying on the hearth rug to using its wings. It fed readily on meat and would drink water, but never became so tame as its companions. Its captive life lasted only a few weeks, its death being apparently hastened by the attacks of the other bats, one of which was detected in the very act of inflicting a bite on the barbastelle's neck.

The color of the barbastelle is extremely dark, so much so, indeed, that by depth of tint alone it can be distinguished from any other British bat. On the hinder quarters, a rusty brown takes the place of the brownish-black hue which characterizes the fore part of the body. Underneath the hair is nearly gray, being, however, much darker towards the neck.

The length of its head and body is just two inches, that of the ears half an inch, and the expanse of wing measures between ten and eleven inches. The ears are tolerably large, and slightly wrinkled. The tragus is sharply pointed at its tip, and widened at its base. A full view of the face shows a rather deep notch in the outer margin and near the base of the ear.



BARBASTELLE.—(*Synotus Barbastelle.*)

Successful Importation of Soles.

The first English soles ever brought alive to this country arrived by the Black Ball packet ship Hamilton Fish, May 21. Captain Mortimer started with twenty-five fish placed in a tank specially constructed so that the lurching of the vessel would not be felt by the fish, the sole, owing to its extreme delicacy, being killed by the least shock. During the voyage the tank was aerated every four hours, and deep sea water was given to the fish. Notwithstanding these precautions nineteen died. The rest came safe and in fine condition. Two were females with spawn. They were planted on the government reservation, just inside Sandy Hook. The sole is a flat fish, of delicious flavor, peculiar to British waters. Many attempts have been made before to introduce it into American waters, but without success.

Novel Mode of Killing Gophers.

In this paper some six months ago there appeared an illustration and description of a novel mode of destroying gophers, moles, etc., by injecting poisoned fumes into their holes and runs. It seems, from the San Francisco *Chronicle*, that the apparatus has been recently tried in that city, and the writer gives the following account of it.

At the Laurel Hill Cemetery, yesterday morning, the agent for a new squirrel, ant, and mole exterminator, gave a test of his apparatus. The machine consists of a furnace constructed of galvanized iron, lined with fire clay, about 12 x 24 inches in size. On the inside of this furnace is a discharge pipe, passing from near the top down through the bottom. To this furnace is attached an air pump by means of sectional tubes and elastic hose, which can be instantly adjusted for operation. A fire having been made in the furnace, and a poisonous compound dropped in, the top is securely closed, the chamber placed over the gopher or squirrel hole, and the air forcing machine started, when all the smoke and poisonous vapors are forced down into the hole, killing, it is claimed, everything animate with which it comes in contact. During the experiments at the cemetery yesterday sulphur was used, being dropped in the furnace in half-pound packages. When the apparatus was put in operation over one of these gopher holes, the ground for a radius of several yards seemed animated by a series of miniature volcanoes, the sulphuric vapors belching forth from numerous undiscovered holes. About ten minutes' pumping serves to thoroughly impregnate the burrow and its connecting drifts with the poisonous fumes, and, it is presumed, to totally annihilate its inhabitants.

Rose Slugs.

The rose slug, like most other insects, has a large number of natural enemies, but these are not yet adequate to the task of keeping it in check. The attention of florists has, therefore, been largely directed to the discovery of some reliable artificial remedy.

Various applications have been tried with more or less success, among which the most certain in its effects is whale oil soap suds, made in the proportions of one pound of the soap to eight gallons of water. The objections to this remedy are that it has a disagreeable odor, and is liable to discolor the opening buds. Dusting freely with powdered white hellebore has also been tried with very good success, and it may be used in water by dissolving a tablespoonful of the powder in two gallons of boiling water. The pyrethrum powders have as yet been used only to a limited extent, but with the prospect that thoroughly applied they would prove effectual. Lime has long been used with satisfactory results, especially if applied when the dew is on the plants.

Capt. E. H. Beebe, of Galena, Ill., wrote some time since to the *Gardeners' Monthly* that he had found powdered sulphur, applied when the leaves were wet, certain destruction, and Miss E. A. Smith corroborates his experience (*Prairie Farmer*, May 4, 1878). Wood ashes were strongly recommended in the *Country Gentleman* for June 13, 1871. The Paris green mixture has been used with excellent results on bushes where it was not desired to cut or pluck the flowers, but in view of the other available means of destruction is not to be recommended. All applications should be made just at night, as they are then more certain of coming in contact with the insects. Something can also be done to prevent the flies from maturing. As the cocoon in which the larva hibernates is very frail, and as the latter does not survive the rupture of the same, it follows that many of the insects may be killed by thoroughly stirring and pulverizing the soil of rose beds. Roses that are transplanted from one locality to another should, before setting, be immersed in a tub of water and have every particle of soil washed from their roots. By observing this precaution newly made gardens may be secured for a long time against this worst enemy of the fairest flower.—*American Entomologist.*

The Grapevine Flea Beetle.

Professor Comstock, the entomologist of the United States Department of Agriculture, gives the following method of fighting an insect which has lately been a great pest in Canadian vineyards. The grapevine flea beetle (*Haltica chalybea*, Illiger) has been one of the most formidable enemies that the grape growers of this country have had to contend with. The only redeeming feature about it is that it seldom appears in the same locality in great numbers during consecutive years. These beetles leave their hibernating quarters in April, and attack and destroy the young leaf buds as soon as they appear; later they feed upon the leaves which have escaped their earlier ravages, and deposit their eggs upon them. The eggs are of an orange color, and soon hatch into small chestnut-colored larvæ. These larvæ also feed upon the leaves, and when they appear in great numbers sometimes strip the vines of their foliage. After a month of active life the larvæ descend to the ground and bury themselves near the surface, where they make cells of the earth, and change to pupæ of a dirty yellow color. The adult beetles, issuing in the course of a few weeks, again feed upon the leaves during the autumn, doing, however, but little damage, and later seek their winter quarters beneath the bark and splinters on the vines and the stakes which support them, as well as under any rubbish that may be in the vineyard. This week specimens of this insect were brought me by Mr. A. R. Phillips, of this city, with the statement that his vineyard in Virginia is infested with them to a perilous extent. I at once sent Mr. L. O. Howard, my first assistant, in company with two others, to the vineyard in question, for the purpose of experimenting with remedies,

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Mr. Howard's report was very gratifying. Finding it impracticable to jar them from the vines into sheets or other receptacles, and keep them there, he hit upon the plan of drenching the sheets with kerosene; this worked in a most satisfactory manner. The mode of procedure is as follows: Take two pieces of common cotton sheeting, each being two yards long and half as wide; fasten sticks across the ends of each piece to keep the cloth open, and then drench with kerosene. Give the sheets thus prepared to two persons, each having hold of the rods at opposite ends of the sheets. Then let these persons pass one sheet on either side of the vine, being careful to unite the cloth around the base of the vine; then let a third person give the stake to which the vine is attached a sharp blow with a heavy stick. Such a blow will in nearly every case jar the beetles into the sheets, where the kerosene kills them almost instantly.

This process, after a little experience, can be performed almost as rapidly as the persons employed can walk from one vine to another. The expense necessary is very trifling, and boys can do the work quite as well as men. Warm bright afternoons are the proper times for this work to be done, and it should be performed faithfully every sunny day until the vines are out of danger. This mode of combating the beetle promises to be much more effectual than any other which has been hitherto suggested; for it can be used early in the season before the vines are seriously injured and before the insects have begun to multiply. In connection with the above, the remedies which have been recommended often should, if necessary, be used. These are as follows: First, all rubbish should be removed from the vineyard, and the stakes and trellises which support the vines be well cleaned of bark and splinters, so as to afford the beetles little chance for hibernating in the vineyard. Second, if the larvæ appear in great numbers, lime should be sifted over the vines.

Protection Against Mosquitoes and Flies.

Quassia water is, according to a correspondent of *Nature*, a protection to peach trees against insect blight. The first year the trees bore well and the new wood was elbow length or more. I next tried quassia in the vinery. Instead of lime-washing the walls to get rid of the green fly, one watering with quassia dismissed them in a day. My head gardener, who had previously much experience in nursery grounds, wondered that he had never heard of it before. He now uses it in all cases as a protection from flies and blight. The dilution goes a long way: one pound of chips of quassia wood boiled and reboiled in other water until he has eight gallons of the extract for his garden engine. He finds it inadvisable to use it stronger for some plants. This boiling makes the quassia adhesive, and being principally applied to the underleaf, because most blight settles there, it is not readily washed off by rain. Quassia is used in medicine as a powerful tonic, and the chips are sold by chemists at from sixpence to a shilling a pound. The tree is indigenous to the West Indies and to South America.

And now as to gnats and mosquitoes. A young friend of mine, severely bitten by mosquitoes and unwilling to be seen so disfigured, sent for quassia chips and had boiling water poured upon them. At night, after washing, she dipped her hands into the quassia water and left it to dry on her face. This was a perfect protection, and continued to be so whenever applied.

At the approach of winter, when flies and gnats get into houses and sometimes bite venomously, a grandchild of mine, eighteen months old, was thus attacked. I gave the nurse some of my weak solution of quassia to be left to dry on his face, and he was not bitten again. It is innocuous to children, and it may be a protection also against bed insects, which I have not had the opportunity of trying. When the solution of quassia is strong it is well known to be an active fly poison, and is mixed with sugar to attract flies, but this is not strong enough to kill at once.

ENGINEERING INVENTIONS.

Mr. Richard B. Ireland, of Trenton, N. J., has recently patented an improved railway signal, in which the sliding night signals carry corresponding day signal arms or banners of different configurations and color, the danger slide being elevated by raising either of the other slides (caution or safety), their normal condition being, of course, danger.

Mr. John R. Jones, of Clarkesville, Iowa, has recently patented an ingenious and effective device for operating car brakes. It may be operated either by hand or by means of a friction wheel fitted on the locomotive. It gives a simultaneous movement to all of the brakes on the train.

Mr. Eugene H. Angamar, of New Orleans, La., has invented a boiler adapted for application to horse cars now in use, so as to utilize such horse cars without material changes. The invention consists in a boiler made in two portions, separated by a mediate chamber, the water and steam spaces of the parts being connected by pipes.

An improved slate dressing machine, patented by Mr. Francis Shenton, of Slatington, Pa., consists of angularly set vertically moving knives for beveling and trimming the end edges of the slates, and, in connection therewith, grooves and ways and other devices for holding the slate in its proper position for the action of the knives, and an arrangement for holding the knives in position to act upon the edges at the proper moment.

THE ARMY WORM ON LONG ISLAND.—The army worm has appeared in great numbers at Islip, Long Island, and is naturally creating much alarm among the farmers.

ROOFED COUNTRY ROADS.

To a large extent in the South and Southwest the highways are of two distinct sorts—in local parlance, *turnpikes* and *mud roads*.

The former title covers the main State roads, often constructed with great care and cost, and usually macadamized. The latter includes the great majority of country roads; and for nine months or more every year the name is exactly descriptive of their character. They are emphatically mud roads, and the mud is deep and tenacious.

Plank roads are sometimes tried where lumber is cheap; but they rest under the disadvantage of being expensive, and they are neither durable nor easily kept in repair. Accordingly mud roads predominate, and the communities possessing them are little given to social or commercial intercourse with their neighbors save during the brief periods when the mud is dry and the wheeling passably good.

An exception to this rule appears in Bosier Parish, Louisiana, where an attempt has been made to keep an important earth road dry and usable by the novel device of roofing it, so as to keep off the rain. The first stretch of covered road on this plan runs from Red Chute Bridge, Louisania, four miles across Red River bottom, near Shrieveport. The idea originated with Judge J. D. Watkins, of Shrieveport, and, as is the usual fate of new ideas, it aroused no little popular ridicule. Judge Watkins was not a man to be laughed down. Obtaining a State charter for his enterprise he began to build the road. His opponents complained that he was obstructing the parish road, and attempted to stop the work; but ample and lawful room having been given for the parish road their opposition came to nothing. It is now four years since the work was begun, and Mr. John S. Williams, of Shrieveport, who has been connected with the enterprise from the beginning, informs us that the road is a complete success. At the time of his writing, in March, while the uncovered roads were axle deep in many places with stiff mud, the shed road was firm and dry.

In building the road, the bed, 18 feet wide, was thrown up just enough to keep out the surface water; and over it was put a roof of plank five-eighths inch thick, the planks being 12 inches wide and 20 feet long. Cypress from the neighboring swamp is used for posts, and roughly sawed timber for frame work. By means of an ingenious platform mounted on a common two-horse wagon and supporting a light framework, four men easily put up 20 sections, of 20 feet each, a day. The cost of the road was about $3,500 a mile, with lumber at $1 a hundred feet, labor $1 a day, posts 12½ cents each, earthwork 20 cents a cubic yard, and nails 5 cents a pound. The advantages of the road arise from its cheapness, as compared with any other style of road possible there, its durability, and its unvarying serviceableness. The native clay soil, when kept dry, makes a better roadbed than either wood or stone, and the road is easily kept in repair. The wagons do not touch the woodwork, and the roof will last five times as long as planks laid upon the damp earth. Though the sides are not enclosed the rain does not drive in enough to make the roadbed muddy, much less wash it. In short the practical test of the road, on the score of cheapness and efficiency, has been so satisfactory that the ridicule and opposition it first awakened have been overcome, and other roads on the same plan are about to be constructed.

Germination of Cotton and other Seeds.

In the opinion of General Le Duc a discovery of value has been made in relation to the planting of cotton. A question having arisen as to the situation of the oil cells in Indian corn, the matter was referred to the microscopist, Prof. Thomas Taylor. He found a series of oil cells near the outer surface, and another row immediately surrounding the chit or germinating point, evidencing the complete protection which the latter received. This fact led Prof. Taylor to experiment, with a view to ascertaining the amount of resistance offered to the attacks of agents generally supposed to be of a destructive nature to all organic life, cotton seed being used in the experiments. For the purpose of removing the cotton from the seed he used concentrated sulphuric acid, which completely removes it without visibly affecting the outer brown shell of the seed.

To test the actual effect on the germinating property he handed some cotton seed thus treated and afterward washed, to Mr. Saunders, who planted it. To the surprise of every one except Mr. Taylor, who had foreseen this result if the germ had not been destroyed, the seed came up at least five days earlier than that in its natural state. To ascertain whether this might not be owing to the soaking the seed received, some was kept for several months and then planted at the same time with seed of the same crop unprepared. The same results followed.

The advantage to planters in having five or six days start can scarcely be overestimated, whether availed of in avoiding early frosts or raising early cotton, for which premiums are offered by several cotton boards in the South. But this is not said to be the principal benefit conferred by the discovery. Hitherto cotton planting has had to be done by hand, and the seed sown broadcast, owing to the adherent cotton preventing the seed being used in the planters used for corn and other clean seed. After preparation the seed can be used in any planter, and, by the regularity of growth resulting, the subsequent cultivation greatly facilitated. The mode of preparing the seed is as follows: The seed is placed in an earthen or glass vessel and ordinary sulphuric acid poured over so as to completely cover it. It is then stirred until the brown shell is left free from cotton. The acid is poured off to be used again, and the seed washed till all acidity disappears from the water, and dried. A large quantity is to be thus prepared and distributed among cotton planters for next season. The acid, after it has become saturated or exhausted, is to be experimented with to ascertain whether the glucose cannot be recovered. Experiments are also to be instituted with a view to ascertain the practicability of the process as applied to seeds slow of germination, such as that of the palm, which takes three years to sprout.

Sugar by Diastase.

It is a curious fact that as diastase, or whatever other substance may be the transforming agent in malt, acts upon starch and converts it into maltose and dextrose, so these products in their turn exert a retarding influence upon further change. The presence of a large proportion of dextrose or maltose undoubtedly stops the transformation of starch, and this fact has been recorded by Schutzenberger and others who have studied the question. It is easy to understand, therefore, that in a very thick mash there may be an incomplete conversion; but if a portion of the dextrose or maltose be removed, and a little fresh diastase added, the action will be continued. This is, to some extent, practically done in the sparging operation in the brewery, but in consequence of the high temperatures usually employed most of the diastase is destroyed. It would appear, therefore, that beneficial results would be obtained by reserving a little of the grist for the purpose of sprinkling it over the malt just prior to sparging; this fresh malt would yield the necessary diastase or converting agent required to transform any unconverted starch or dextrine into sugar. It may be argued that there will be loss, in consequence of the last addition of malt not being completely extracted, but this might be obviated by making a small separate mash of it at a comparatively low temperature.—*Brewers' Guardian.*

Land Birds at Sea.

During a recent passage of the White Star steamer Germanic from Liverpool to New York, and when about one thousand miles from Queenstown, a strange bird was discovered in the rigging. The sailors and passengers endeavored to catch it, but without success, until Dr. C. W. Goff, of this city, one of the passengers, came on deck, when the bird at once flew into his hands. The doctor cared for it, and upon the arrival of the steamer presented the bird to the collection at the Central Park. The bird is known as the whimbrel—a peculiar land bird resembling the curlew in habits and about the size of a prairie hen, black and gray plumage, wings like a bat, with a long whalebone-like bill in shape similar to that of a woodcock. Great interest was attached to the bird by the officers of the ship from the fact of its being a land bird found so far at sea, with wings but poorly calculated to sustain it for any length of time.

The owl "Kate Field," captured under similar circumstances in mid-ocean last autumn by one of the crew of the White Star steamer Celtic, is still at the Central Park, thriving, contented, and doing honor by the wisdom of her countenance to the name she bears.

Coin in the Sub-Treasury.

The law requiring the coinage of $2,000,000 a month in silver dollars, in connection with the public aversion to handling large sums in silver when bills can be obtained, has resulted in making a serious plethora of coin in all our government depositories. Those at San Francisco, Cincinnati, and Chicago were all filled early in March, and those at Washington, Boston, Philadelphia, and St. Louis reached the limits of their capacity soon after. As a consequence nearly all the newly-coined silver is being piled up in the Sub-Treasury in this city. This inconvenient treasure, weighing over 612 tons, is stored in a huge vault, 47 feet long, 27 feet wide, and 12 feet high. In the same vault are stored 130½ tons of gold, worth over $65,000,000.

Burnt Alum.

Ordinary alum is a double sulphate of potash and alumina, containing, when crystallized, twenty-four molecules of water. When heated, it melts in its water of crystallization, and on continued heating this is expelled, leaving a dry powder, known in pharmacy as *Alumen usta*, or burnt alum. That sold at the drug stores is often imperfectly dried, and should be placed for an hour or more in a hot bake oven before use. According to C. Bernbeck the best test for a good article is, that it is nearly tasteless when put on the tongue, and takes twelve to twenty-four hours to dissolve in water. Much of the alum now in commerce contains no potash, the alkali being ammonia. Of course ammonia alum cannot be converted into burnt alum, as the ammonia is expelled at the same time, leaving only sulphate of alumina behind.

Memphis Reclaimed.

It is reported that Memphis is at last clean, and so far worthy of exemption from further epidemics of yellow fever. Twenty miles of sewer pipes have been laid already, and over 700 men are now at work for the district government. Thirty miles of sewers will be finished by June 1. This will nearly complete the sewer system. In addition, an equal number of miles of drain tile have been laid. Aside from sewerage and drainage, mention must be made of the cleaning and filling of vaults, the demolition of hundreds of old buildings, the tearing up of the Nicolson pavement, the cleaning up of cellars, and the general renovation of stores and dwellings.

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Pressure in Heavy Guns.

The powder question in all its aspects is just now a matter of peculiar importance, as affecting our monster ordnance. In saying this we refer not only to the size and quality of the so-called grains, but likewise to the construction of the cartridge and the mode of firing it. In the ramming of the cartridge a very safe powder may be transformed into a very dangerous one, by the crushing of the cubes or prisms, so as to convert large grain powder into small grain. The last round fired from the rent gun on board the Duilio was subject to this peril, if we may accept the statement that the cartridge stuck in the chase and had to be rammed home with unusual force. But this is not all. When a cartridge is fired from an axial vent in the gun, it is just possible that ignition may commence at the rear of the charge, despite those internal arrangements which are intended to secure a different result. It is well known that when a long cartridge is ignited at either extremity, particularly the rear, wave pressures are set up, far exceeding the normal force of the powder, and acting locally with great violence. The term "pressure" is perhaps hardly applicable to the force thus exercised, its character being obviously dynamic, the powder chamber being subjected to actual blows occasioned by the dashing to and fro of the gases, and probably of the liquid product of combustion also.

What this force really amounts to is instructively shown by some experiments carried out at Woolwich with one of Mr. Vavasseur's steel guns, weighing 16 tons, and having a caliber of 10 inches. The projectile in each instance weighed 400 pounds. A charge of 70 pounds of service pebble powder was made up, with a cartridge 25 inches long, and the point of ignition was at the center of the charge. Under these circumstances the crusher gauge at the rear end of the charge showed a pressure of 21 tons on the square inch, and at the base of the shot 18 tons, the initial velocity of the shot being 1,412 feet per second. In the next round everything was the same, except that the powder was fired at the rear end of the charge. The pressure at that spot rose to 45·1 tons per square inch, and at the base of the shot it became 50·1 tons. Despite this enormous pressure the velocity of the projectile was only slightly raised, becoming 1,436 feet per second. With 75 pounds of powder fired in the same manner, the cartridge being 26 inches long, the pressure was practically the same as before at the rear end of the charge, but rose to 59 tons per square inch at the base of the shot. The initial velocity then became 1,497 feet per second.

In the next round the charge consisted of 80 pounds of service pebble, the cartridge being 27½ inches long. The point of ignition was continued at the rear, and the pressure at that spot became 57·6 tons per square inch, rising to 63·2 tons at the base of the shot, the initial velocity being 1,541 feet per second. A charge of 80 pounds of 1½ inch cubical powder was then fired in the same manner, the rear pressure being 25·1 tons, the forward pressure 24·8 tons, and the initial velocity 1,482 feet. Finally a charge of 88 pounds of 1½ inch powder was fired from the rear end, the pressure at the rear of the charge becoming 36·4 tons per square inch, and at the base of the shot 24·1 tons, the projectile having an initial velocity of 1,514 feet per second. We may add that there was one other round, in which the charge consisted of 70 pounds of service pebble powder, the ignition being at the rear, when the pressure at the rear end of the charge was 45 tons per square inch, and at the base of the shot 37·5 tons, the initial velocity being 1,455 feet.

The results thus obtained are peculiarly interesting at the present time, and it may be allowed that the gun was a strong one which withstood such abnormal pressures. It is obviously a matter of especial importance, where an axial vent is used, that proper means should be taken to secure the ignition of the charge at the right point. The violent ramming of a cartridge might perhaps damage its internal structure so as to bring about ignition at the rear instead of the center, with the certain result of abnormal pressures at particular spots, especially in the fore part of the powder chamber.—*The Engineer.*

American Locomotives for Japan.

The Japanese Government is completing the Poronai Railway connecting the City of Hokkaido with adjacent towns. Col. Jos. N. Crawford, an American engineer, is in charge, and has recently had shipped a pair of narrow gauge (42 inches) locomotive engines to that country. They were built by H. K. Porter, of Pittsburg, Pa., and are named the "Yoshitsune" and the "Benkei," after noted characters in ancient Japanese history. In accordance with suggestions, these engines possess peculiar features as to stacks, ash pans, and spark arresters, from the fact that the line passes through the most inflammable class of property.

The engines are of the "Mogul" pattern, with six drivers of 36 inches diameter; cylinders, 12 x 16 inches; weight, ready for service, 18 tons. The same firm have just completed an engine of novel proportions for shipment to the works of the Longfellow Mining Company of Arizona. The gauge in this engine is only 20 inches; cylinders, 6 x 10 inches; four drivers of 22 inches diameter supporting the engine, which is a compact business-like looking affair, weighing 4½ tons, and planned to overcome a gradient of 100 feet to the mile. The Longfellow Works are a New York enterprise, this little engine being ordered by J. Freudenthal of this city. After being taken apart and boxed, the "Coronado" was shipped to Los Vegos, N. M., thence to the mines by wagon.

Railway Improvements Wanted.

In offering prizes for the period of six years ending with July 15, 1881, the German Railroad Union suggests the following as especially desirable: (1) The invention of a locomotive, tender, or car wheel of simple but safe design by which the loosening of tires will be effectively prevented. (2) The invention of a simple apparatus, which can be depended upon under all circumstances, which will render it possible for trainmen on different parts of a long train to communicate with the engineman. (3) The invention of a cheap but reliable signal apparatus for the automatic blocking of trains which follow each other closely upon the open road, for regulating and rendering safe the traffic on crowded sections of road. (4) The invention of an apparatus which will make it possible for a trainman with the ordinary form of brake to apply the brakes simultaneously on two adjacent cars. This is required especially for freight cars. (5) Plans for improved statistics of the distribution and movement of cars, having regard to the administrative requirements of the separate roads, the settlement of the accounts for interchanged cars, and general statistical purposes. (6) The preparation of an exhaustive commentary on the working regulations, with special reference to the decisions of recent years. (7) A treatise based on statistical investigations of the influence and desirability of the present usual division of passengers and arrangement of cars into three or four classes, from a general standpoint as well as with regard to the profit to the roads. (8) A short abridged encyclopedia of the technics of railroads, in the sense of genuine encyclopedia, that is, a systematic grouping of the materials and their relation to each. (9) A history of the development of freight tariffs and their influence on the public welfare.

A Steep Railway.

A letter from Naples, written by one of the nine persons who made the experimental trip on the new railway to the crater of Vesuvius, gives some particulars of the line and the journey. The actual railroad is 800 meters long and terminates 200 meters short of the mouth of the crater. The inclines are tremendous: 4 in 10 for the first 135 meters; 63 in 100 for the next 330 meters; then 56, 52, and finally 48 in the 100 for the remainder. The carriages are drawn up by a steel rope of forty-nine strands, which is coated with tar as a protection against rust. An hour's drive from Naples takes the traveler to the mountain observatory. An excellent new road, nearly two miles long, has been built by the railway company from the observatory to the railway station. The ascent on the railway was made in seven minutes, but it can easily be made in five. The motion was quite smooth, but the sensation on looking out is far from pleasant, and a feeling akin to sea-sickness is said to arise. The view from the summit repays all the trouble. The writer says that at every step one feels the proximity of the great storehouse of heat. He was informed that great pillars of smoke frequently burst up from the ground, close to the spot where the railroad ends, and great chasms open, swallowing up anything which may be on the spot, so that the expedition may sometimes not be wholly free from danger. It was intended to open the line for the public at the beginning of May.

Saving is Wealth.

There is nothing new in this, but it is a subject fraught with so much importance to the young who would succeed in life, that it is well to refreshen their memories by often repeating the axiom.

Moreover, as the *American Pottery and Glassware Journal* says, waste and extravagance have been the bane of our times. Owing to these multitudes have become bankrupt, and because of them many are to-day unable to make any headway in the world. In the face of all the lessons of the past and of all the warnings of the present, there is a strong disposition to spend money recklessly in dress, equipages, entertainments, and innumerable useless ways. Stripling boys and young misses think nothing of devoting more every month to dress than clothed their fathers and mothers for a year; and yet they appear to no better advantage in society and are no more respected than were these same parents in their youthful days. Every cent they can make for themselves or wring from parents or friends is disposed of without any thought of the bad habits they are cultivating, of the demands of sickness and old age, or of the possible crimes to which they may expose themselves in the hour of temptation to meet the results of their outlays.

The great difference between those who save and those who do not in the struggle of life, consists not so much in early advantages or superior ability, other things being equal, as in the power to resist wasteful expenditure and sinful indulgences and to save something.

One evening lately, Hon. William E. Dodge, of New York, delivered an address embodying his recollections of New York for the last sixty years. Near the close he uttered these words, which should be carefully weighed by every young man and woman:

"In conclusion, permit me to say that, as I think of my early business life, I am impressed with the fact that those young men who were then known as industrious, high-minded youths, conscientious in the discharge of their duties, were those who succeeded in business on their own account; while many who had better opportunities failed, because they would indulge in pleasures which not only impaired confidence, but wasted what might have aided them in commencing for themselves. All young men should aim to save something each year, even at the expense of a limited wardrobe and many little things which they think necessities. If there were none but young men here, I would say that from the first year when I entered a store, with a salary of fifty dollars, to my last year—when as a salesman I received for those days very large pay—I never failed to save a portion; and when I started in business that sum and my experience were all my capital."

Epidemic Cycles.

Dr. Arthur Ransome, of Manchester, has been adding to his writings on epidemic diseases and allied subjects a very interesting and thoughtful paper on "Epidemic Cycles." Making use particularly of certain annual death rates which have been kept in Sweden since 1774, he finds in them, according to the *Lancet*, "internal evidence of accuracy in the characteristic peculiarities of the course of each disease," and holds that "they bear ample witness to the fact of the regular succession of epidemics in distinct cyclical periods." He has thrown the data from this source and from other sources into a series of diagrams, and from them he concludes that *whooping cough* has a cycle of about four years; *small pox*, before the introduction of vaccination, had a cycle of from four to five years; the cycle of *measles* is about seven years; while *scarlet fever* has an extended cycle of from fifteen to twenty years, when it recurs as a great visitation, fluctuations forming "less undulations," so to speak, occurring in the intervals. Dr. Ransome briefly considers the conditions which may probably determine the recurrence of these cycles, not omitting the question of possible relationship with the sun spot period. This question he illustrates by a most interesting diagram of the sun spot periods since 1775, but he is unable to trace any relationship between these periods and the epidemic cycles. He comes to the conclusion that the facts relating to the different cycles are susceptible of a simpler explanation than is commonly conceived. "A certain density of the population at susceptible ages," he says, "is necessary before a disease can spread with the vigor of an epidemic. Probably all the facts would be accounted for, if we suppose that these disorders can only become epidemic when the proximity between susceptible persons becomes sufficiently close for the infection to pass freely from one to the other. Exanthematous diseases rarely attack the same individual twice in his lifetime. When, therefore, an epidemic has, by either a fatal or non-fatal attack, cleared away nearly all the susceptible persons in a population, mostly infants and children up to a certain age, then it must necessarily wait a certain number of years before the requisite nearness of susceptible individuals has been again secured. There must in the intervals be a gradual restocking of the nation with material fit for the epidemic to feed upon, and it can only spread when the requisite proximity is attained, when meshes of the network of communication are sufficiently close for it to include all susceptible persons in one grand haul."

The Water Supply of Cities.

In a discussion in Congress, relative to the water supply of the District of Columbia, the following statement was given of the average daily *per capita* consumption of water in different cities, the figures being from official reports:

City.	Gallons.	City.	Gallons.
Providence	25	Detroit	105
Fall River	26	Chicago	119
Lowell	33	Washington	155
Lynn	34	New York	100
Rochester	35	Albany	80
Columbus	43	Jersey City	99
Lawrence	44	London (England)	29
Milwaukee	53	Liverpool (England)	23
Cambridge	55	Glasgow (Scotland)	50
St. Louis	56	Edinburgh (Scotland)	38
Cleveland	56	Dublin (Ireland)	25
Cincinnati	57	Paris (France)	28
Philadelphia	58	Tours (France)	22
Brooklyn	63	Toulouse (France)	26
Montreal	69	Lyons (France)	20
Boston	75	Leghorn (Italy)	30
Toronto	77	Berlin (Prussia)	20
Buffalo	87	Hamburg (Prussia)	33

New Industry for Petrolea.

The *Petrolea Topic* says: "It will be remembered that some time ago the enterprising refining firm of J. L. Englehart & Co. commenced the sinking of a well to the proposed depth of 2,000 feet, for the avowed purpose of testing the idea entertained that a hitherto undeveloped vein of petrolum lay far beneath the one at present worked at a depth of five hundred feet. The work on this 'deep well' has been unremittingly continued, and on Monday morning last, had reached a depth of 1,185 feet without developing anything specially novel. At this point, however, the drill plunged into a bed of pure salt, and up to the date of writing had bored through one hundred feet of this substance.

The Italian Exhibition.

At the Industrial Exhibition of Milan, in 1881, the leather industry will be especially represented by products from all parts of the country. Prof. Guido Susovy offers a prize of 600 lire ($150) for the best upper leather. The office of the executive committee of the Exhibition is located in Milan.

The leather manufacturers of Trente and Verona are considered to be at the head of the profession in Italy, the south of Italy being far behind in the tanning business. In tanning materials one firm in Monaco principally supplies the trade. Genoa is the great importing seaport for raw hides; Rome has the trade in calfskins, mostly imported from Chili; Leghorn has the African importation, and Venice that from the Orient.—*Shoe and Leather Reporter.*

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RECENT DECISIONS RELATING TO PATENTS, COPYRIGHTS, ETC.

Supreme Court of the United States.

PARKS *et al. vs.* BOOTH.

1. It is essential to the validity of a patent that the particular invention be pointed out and distinguished from what is old, and when the invention consists merely of a new combination of old elements or devices, where nothing is or can be claimed except the new combination, it is sufficiently described to constitute a compliance with the letter and spirit of the law if the devices of which it is composed are specifically named, their mode of operation given, and the new and useful result to be accomplished is pointed out, so that those skilled in the art and the public may know the extent and nature of the claim and what the parts are which co-operate to do the work.

2. It is not necessary to allege or prove, in order to sustain the defense of prior patent or printed publication, that such patent or publication was issued or given two years earlier than the patentee's invention.

3. Where the patent covers an entirety it cannot be defeated by showing that the several component parts are old in other connections. It must appear that they have existed together in the same relation.

4. More than one patent may be included in one suit and more than one invention may be secured in the same patent, in which cases the several defenses of prior invention and public use may be made to each patent in the suit and to each invention to which the charge of infringement relates.

5. The patent act allows the infringer to plead and prove that the invention of the patentee had been in public use or on sale in this country for more than two years before the inventor applied for a patent; but no question of priority is open under that defense, nor will evidence sustain it that another had made or patented the invention two years before the application without the knowledge of the patentee whose invention is in question.

6. It not appearing that the complainant was guilty of laches in applying for a patent, or that *his improvement* ever went into public use or was on sale in this country before he applied for a patent, the patent was held to be valid.

7. Interest on the profits decreed to the complainant should not be allowed. The profits in such cases to be regarded in the light of unliquidated damages, which usually do not draw interest without the special order of the court.

Appeal from the Circuit Court of the United States for the Northern District of Ohio.

Mr. Justice Clifford delivered the opinion of the court.

U. S. Circuit Court—Southern District of New York.—Choate, J.

ROSENBACH *vs.* DREYFUSS *et al.*—COPYRIGHT.

Decided April 28, 1880.

Section 4,963 of the Revised Statutes, providing that "every one who shall insert or impress such notice" [Entered according to act of Congress, in the year ——, by A. B., in the office of the Librarian of Congress, at Washington] "or words of the same purport in or upon any book, map, chart, musical composition, print, cut, engraving, or photograph, or other article for which he has not obtained a copyright, shall be liable to a penalty of one hundred dollars, recoverable one-half for the person who shall sue for such penalty and one-half to the use of the United States," is a penal statute to be strictly construed, and its terms cannot be extended beyond the case of articles subject to copyright, which is the limit indicated by the terms of the statute itself if read in connection with the other sections.

2. The purpose of the statute is to protect persons entitled to copyright from their privilege being impaired, and the offense against the statute is deceiving the public by the false assertion of a valuable privilege; but where the article marked as copyrighted is not the subject of copyright, neither the right of another is impaired nor can the public be deceived.

3. A print of a balloon or hanging basket, with printing indicating the embroidery and cutting lines, does not fall under either of the heads of "print," or "model or design intended to be perfected as a work of the fine arts," or "pictorial illustrations or works connected with the fine arts," enumerated in the copyright statutes.

4. Under the general rule of pleading that the plaintiff must state with reasonable certainty a case for recovery a demurrer was sustained where it did not appear by the complaints that the articles described therein were subjects of copyright under the laws of the United States.

By the Acting Commissioner of Patents.

HIBBARD *vs.* RICHMOND.—FEATHER DUSTERS.

Decided April 30, 1880.

Patent granted to Susan M. Hibbard May 30, 1876, No. 177,939. Application of Gilbert M. Richmond filed September 10, 1874.

NEW TRIAL:—Where in an interference between two applicants for a patent priority of invention was awarded to one of them and a patent issued accordingly: *Held*, that the issue of the patent constituted no bar to the reopening of the interference between the defeated applicant, whose application was pending in the Office, and the patentee, upon proof of fraud or newly-discovered evidence and in the absence of laches on the part of such applicant, and that upon proof on the new trial that the applicant was the original and first inventor he was entitled to the patent.

Appeal from Examiners-in-Chief.

United States Circuit Court.—District of New Hampshire.—Lowell, J.

PERKINS *vs.* NASHUA CARD AND GLAZED PAPER COMPANY.—WHAT CONSTITUTES PUBLIC USE.

Decided May 15, 1880.

There is very little conflict of evidence in this case. The patentee made a machine containing his invention in the year 1857, and in 1863 he substituted for it another, varying in form and proportions but not in principle. These machines he used successively in the ordinary way of his business as a maker of card and pasteboard until he applied for his patent in 1876. The specification and model represent precisely the machine of 1863.

During the time that the machines were used they stood in the room with several other machines necessary for the other processes of making, drying, and coloring pasteboard, and were operated chiefly by one man, Moulton, who was sometimes assisted by one other. About twenty-three workmen were employed upon the other parts of the manufacture.

The doors of the factory were usually kept locked, and each of the twenty-five workmen had a key. How many visitors came to the factory is one of the disputed points. There were occasional visitors, but not many persons came to the factory from mere curiosity.

During some months Mr. Denison, a friend of the patentee, was given the use of an upper room for making tags, and his workmen passed in sight of the pasting machine. It is not proved that any workmen, visitors, or other persons acquired or divulged a knowledge of the mode of operation of the machine until the workman Moulton gave that information to the defendants in 1876.

Was the invention in public use for more than two years before Perkins applied for his patent? The time was enough. Was the use a public use? The law desires to encourage inventors to make their discoveries known for the improvement of the art and to discourage an extension of the monopoly beyond the statutory period. For these reasons and because of the difficulty of ascertaining the amount of knowledge which may have been derived from the exhibition, publication, or use of the invention, it has always been held that when the public have had means of knowledge they have had knowledge of the invention. Thus if a book has been published describing the invention it is not important that no one has read it. (*Stead vs. Williams*, 7 M. & G., 818.) If a pier has been placed in the bed of a river or a pipe underground it is conclusively presumed to be known to all men. It has been intimated that a use in a workshop where the workmen are pledged to secrecy may not be a public use. (*Kendall vs. Winsor*, 21 How., 322; charge of Curtis, J., ; *Bevin vs. Easthampton Bell Company*, 9 Blatchf., 50; *Heath vs. Smith*, 3 Ellis & B., 255.) In the last of these cases it is held that if the invention has been worked in the ordinary way without an injunction of secrecy the use is public. In *McClurg vs. Kingsland* (1 How., 202), it is said by Mr. Justice Baldwin, *obiter*, that use in a factory is a public use. A use very trifling in amount, or a publication purely technical, or a single sale has often been held to deprive an inventor of his patent, without evidence that any one interested to acquire knowledge of the invention had acquired it. (*Henry vs. Providence Tool Company*, 14 O. G., 855, *Egbert vs. Lippman*, 14 O. G., 822; *McMillan vs. Barclay*, 5 Fish., 489; *Re* Adamson's patent, 6 DeG., M. & G., 420; *Patterson vs. Gaslight Company*, 3 App. Cas., 239; *Lange vs. Gisborne*, 31 Beav., 133.)

The difference between this case and *Manning vs. Cape Ann Isinglass Company* is that in that case the inventor after dissolving his partnership permitted his partner to continue to use the invention. Neither of the partners used the invention excepting in their respective factories (the circumstance makes that case a little stronger), but my opinion was that the use by the firm before they dissolved their partnership was a public use. Taking these decisions together, I understand the law to be that actual knowledge of the invention need not have been derived by any one interested to practice it. It is enough that any one or more persons not under a pledge of secrecy saw the invention practiced, or even might have seen it if they had used their opportunities, provided it was in fact practiced in the ordinary way after being completed. And it must be held either that the workmen and visitors were a part of the public or that they were persons from whom the public might have acquired the art without a breach of trust.

There was no pledge of secrecy proved here, and there was some evidence that none was exacted from anybody. There was no evidence of concealment except that the factory was not open to chance visitors. It was understood, I suppose, as most factories are conducted with no intention of divulging any secrets and none to have curious and prying persons admitted; but without any special precautions beyond what prudent men who do not care to be interrupted in their business would usually adopt. For my own part, I should have some doubt whether a pledge of secrecy exacted of a number of workmen who had nothing to do with the machine in question and had opportunity to examine it if they chose would make the use a secret one.

There is some evidence intended to prove that the use was experimental; but upon the whole record it is clear that the machines were used for about twenty years in the ordinary business of the patentee, and worked so well that when Moulton first expressed an intention of leaving the factory and building a machine for the defendants the plaintiff raised his wages one-third. He did not say it would involve a breach of trust.

A short time before the patent was applied for some experiments were made which resulted in nothing of importance, and, I fear, were intended to benefit the patent rather than the machine. An improvement has now been made, but it is not described in the specification shown in the model. At all events, a machine which, whether entirely satisfactory or not, has been run in the ordinary course of business for twenty or thirty years, and which is patented precisely as it was used, cannot properly be called an experimental machine.

The decree must therefore be, bill dismissed, with costs.

United States Circuit Court.—Southern District of New York.—Wheeler, J.

ALLEN *vs.* CITY OF NEW YORK.—FOLDING SEAT PATENT.

1. Reissued patent No. 21, to Aaron H. Allen, January 15, 1861, for improvements in seats for public halls, declared valid.

2. The seats in the original patent were to be turned up by weights, while in the reissue the weights may be dispensed with and the seats moved up otherwise: *Held*, that the reissue is not for an invention different from that contained in the original patent.

3. Although the stove door, carriage seat for a child, and opera board to a carriage, relied upon in defense, are turned down, stopped, and held and turned up out of the way as are these seats, such contrivances are not anticipations of this invention, since they could not be arranged as seats in public halls without additions and alteration requiring the exercise of invention.

4. A description in a prior patent is no anticipation of a patent the application of which was filed before the application of such prior patent.

5. The defendant in this case is a proper party to account for profits, as are also its board of education and department of instruction, by whom the seats constituting the infringement were introduced into the schools.

Decree sustaining the patent.

United States Circuit Court.—Southern District of New York.—Wheeler, J.

SHARP *vs.* TIFFT.—GAS STOVE PATENT.

Decided May 8, 1880.

1. Substantially the same combination of devices, although of different form and capacity, having been used before the patentee's invention, he is entitled only to his particular form of devices which are really different, and the combination of those devices with each other or with others so as to produce a new result or an old result in a new way.

2. A reference in a disclaimer to a particular form of the device not so limited in the claim is merely descriptive of that form without taking away or adding anything thereto.

3. When the reissue describes only what was described in the original patent, both as to the devices and the nature of the invention, it cannot be said that the invention in one is different from that in the other, although the claims have been changed and enlarged.

4. A patent for a combination of known parts, materials, or elements is not infringed by the use of any number of the parts, materials, or elements less than the whole.

5. Where some parts of the combination are new, and those parts are taken and used in the same manner, but with different elements for the rest of the combination patented, a part of the invention is taken, although the whole is not, and it is an infringement to that extent.

6. A disclaimer filed after the suit was brought ordinarily deprives the plaintiff of costs in the suit; but where the disclaimer was not necessary to sustain the patent to the extent it is held valid, was inoperative, in the view taken of it, upon the patent, and has no effect in maintaining the suit, cost may be allowed the plaintiff as though no disclaimer had been filed.

Test for Organic Impurities in Water.

The use of a dilute solution of tannic acid has been suggested for this purpose by J. P. Dahlen. The test solution should contain five per cent of tannin, and five parts of it should be added to one hundred of the water. If organic matters be present, a pellicle or scum will rapidly form; this scum formation can be recognized by the immediate appearance of an iridescence or play of colors, and the growth of fungus vegetation can be detected without a microscope by the little bubbles of carbonic acid which collect around the edges of the surface. In every sample of water where this turbidity or scum is formed, or where a fungoid growth occurs soon after addition of the tannin solution, it is a sure sign that organic matters are present. When these organic matters have been destroyed by evaporating, heating, etc., no such turbidity or fungoid growth occurs on addition of the tannin solution.

Train Wrecking in Spain.

A gang of train wreckers have met with the kind of punishment in old Spain which we would like to see that class meet with in this country. A gang which recently wrecked a train in Andalusia was court-martialed, thirteen of them sentenced to death and thirteen to imprisonment for twenty years. This country stands very much in need of Spanish civilization, and if it could be introduced into Illinois, Missouri, Iowa, and certain other parts where the industry of train-wrecking and robbing is followed with considerable success it would be a good thing.

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Patent Steam Cranes. See illus. adv., page 381.

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4 to 40 H. P. Steam Engines. See adv. p. 348.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

Blake "Lion and Eagle" Imp'd Crusher. See p. 365.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 366.

Peck's Patent Drop Press. See adv., page 364.

Air Compressors, Blowing Engines, Steam Pumping Machinery, Hydraulic Presses. Philadelphia Hydraulic Works, Philadelphia, Pa.

Improved Solid Emery Wheels and Machinery, Automatic Knife Grinders, Portable Chuck Jaws. *Important*, that users should have prices of these first class goods. American Twist Drill Co., Meredithville, N. H.

Elevators.—Stokes & Parrish, Phila., Pa. See p. 382.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Company, Buffalo, N. Y.

For Standard Turbine, see last or next number.

SteamHammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Eagle Anvils, 10 cents per pound. Fully warranted.

Wanted—The address of 40,000 Sawyers and Lumbermen for a copy of Emerson's Hand Book of Saws. New edition 1880. Over 100 illustrations and pages of valuable information. Emerson, Smith & Co., Beaver Falls, Pa.

$275 Horizontal Engine, 20 H. P. See page 382.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 316.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

For Wood-Working Machinery, see illus. adv. p. 380.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 803.

For Separators, Farm & Vertical Engines, see adv. p. 382.

Best American Shot Gun made is the "Colts." Far superior to any English guns for the same price. For description, see SCI. AMERICAN of May 29. Send for circular to Hodgkins & Haigh, Dealers in General Sporting Goods, 300 Broadway, New York.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 301.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 381.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 381.

For Middlings, Mill and Mill Furnishing, see adv. p. 381.

C. J. Pitt & Co., Show Case Manufacturers, 226 Canal St., New York. Orders promptly attended to. Send for illustrated catalogue with prices.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 380

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Large knife work a specialty. Also manufacturers of Soloman's Parallel Vise. Taylor, Stiles & Co., Riegelsville, N. J.

Penfield (Pulley) Block Works. See illus. adv. p. 382.

Wheels and Pinions, heavy and light, remarkably strong and durable. Especially suited for sugar mills and similar work. Circulars on application. Pittsburg Steel Casting Company, Pittsburg, Pa.

For Patent Shapers and Planers, see ills. adv. p. 380.

NEW BOOKS AND PUBLICATIONS.

THE AMERICAN HOYLE. Dick & Fitzgerald, New York. Price $2.

A revised edition of this authoritative hand book of games, rewritten and adapted to the American method of playing, has just been issued. The compiler claims for this book the most recent and reliable rules practiced in this country. A chapter on the doctrine of chances embraces curious problems which interest every one.

ON THE GHOSTS IN RUTHERFURD'S DIFFRACTION SPECTRA. By C. S. Peirce. 4to, pp. 17.

A QUINCUNCIAL PROJECTION OF THE SPHERE. By C. S. Peirce. 4to, pp. 3, with Chart of the World on a Quincuncial Projection.

Two important contributions to exact science, published by the authority of the Superintendent of the United States Coast and Geodetic Survey, in the American Journal of Mathematics, Vol. ii., 1879. The quincuncial projection which Mr. Peirce has invented possesses the following properties: 1. The whole sphere is represented on repeating squares. 2. The part where the exaggeration of scale amounts to double that at the center is only 9 per cent of the area of the sphere, against 13 per cent for Mercator's and 50 per cent for the stereographic. 3. The angles are exactly preserved. 4. The curvature of lines representing great circles is in every case very slight over the greater part of their length.

METHODS AND RESULTS. NOTE ON THE THEORY OF THE ECONOMY OF RESEARCH. By C. S. Peirce. Quarto, pp. 7.—MEASUREMENTS OF GRAVITY AT INITIAL STATIONS IN AMERICA AND EUROPE. By C. S. Peirce. Quarto, pp. 145. Washington: U. S. Government Printing Office. 1879.

These valuable reports are reprinted from the Report of the United States Coast Survey for 1876, to which they form appendices No. 14 and No. 15.

TWELFTH AND THIRTEENTH ANNUAL REPORTS OF THE TRUSTEES OF THE PEABODY MUSEUM OF AMERICAN ARCHÆOLOGY AND ETHNOLOGY. Cambridge: 1879 and 1880. Vol. II. Nos. 3 and 4.

In addition to matters purely official these reports contain reports by the Curator on the progress of special explorations under the direction of the museum, and valuable papers by gentlemen engaged in such work. A large part of the Twelfth Report is occupied by the third part of Ad. F. Bandelier's elaborate study of the social organization and mode of government of the ancient Mexicans.

THE STANDARD SERIES. New York: I. K. Funk & Co.

Five years ago, in an article entitled "A New Style of Bookmaking Needed," the SCIENTIFIC AMERICAN expressed the successful book maker of the future would print for the million as well as for the few and be the gainer by it; and that any responsible firm which should enter at once upon the work of publishing good books, especially scientific books, at a quarter the usual price would achieve a splendid success. But they would have to print editions of a hundred thousand. Since that day the business of publishing in cheap form books of temporary interest, chiefly novels, has developed wonderfully; but it has been left for Messrs. Funk & Co. to do the same with books of sterling value, such as we called for so long ago; and they are printing them on legible type, using a good quality of white paper, at rates that are marvelously low. For example there have come to our table Ruskin's Letters to Workmen and Laborers (Fors Clavigera), in two parts, at 15 cents each; Carlyle's Essays on Goethe, Burns, Luther's Psalm, Schiller, Memoirs of Mirabeau, and Death of Goethe, complete in one volume for 20 cents; John Stuart Blackie's three Essays on Self-Culture together, 10 cents; and Knight's Popular History of England, in eight volumes, at 30 cents each, or no more for the entire work than a single volume has cost hitherto. Enterprise and sound judgment of this sort deserves, and we are confident will win, the highest success. The books which are thus placed within the easy reach of the million are such as the million may read with pleasure and profit.

COMMON MIND TROUBLES, AND THE SECRET OF A CLEAR HEAD. By J. Mortimer Granville, M.D., etc. Philadelphia: D. G. Brinton. 1880.

Dr. Granville discusses in a sensible practical way mental and moral failings, defects of memory, confusions of thought, sleeplessness, low spirits, good and bad tempers, etc., and the American editor adds in the same vein chapters on "mental languor and listlessness," and "morbid fear." The second part enforces the lessons taught in the first part and tells how to keep the head clear and the mind efficient. The work is hopeful, thoughtful, and cannot fail to be useful.

MULTIPLICATION AND DIVISION TABLE. By Leonard Waldo, S. D. (Harv.) New York: John Wiley & Sons. 1880. Folio, pp. 4.

This table, containing the product of numbers between one and one hundred, is intended for the use of accountants, computers, and teachers in primary schools. The arrangement of the table is excellent; and, if the large size of the pages does not make it awkward to handle, it cannot fail to greatly facilitate computation.

REPORT OF THE NEW YORK STATE SURVEY FOR 1879. THE NIAGARA FALLS RESERVATION. By James T. Gardner, Director. Albany: Charles Van Benthusen & Sons. 1880.

The first and larger part of this Report is devoted to the examination of the lands around Niagara Falls, with reference to their convenience into a sort of International Park. Part II. covers the work of the general State survey, during the past year, in Onondaga, Oswego, Madison, and Oneida counties. The Report is accompanied by a map of Eastern and Central New York, showing the results, of accurate survey; and the first part is illustrated by a number of heliotype prints of photographs of Niagara scenery.

REPORT OF THE STATE ENGINEER TO THE LEGISLATURE OF CALIFORNIA, SESSION OF 1880. Sacramento: State Office.

In this report State Engineer Hall reviews: 1. The year's operation of the department; 2. The drainage of California valleys, and the improvement of the navigation of the rivers; 3. The flow of mining detritus; 4. The irrigation of the plains; 5. Present condition of the inquiry with regard to California river improvement, storage and disposal of mining detritus, and irrigation.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) W. F. B. asks: 1. Will not a galvanic battery containing fifty cells become exhausted as soon as one containing but one cell? A. If the work performed is proportionately the same there will be no difference. 2. Is there any way of regulating the consumption of the zincs of a battery, as of coal in a furnace? A. Keep the zincs well amalgamated, and keep them out of the solution when the battery is not in use. This does not apply to sulphate of copper batteries. 3. What dimensions must I follow, if there is any fixed rule, in making electro-magnets of any lifting capacity I may desire? A. As the lifting power of magnets depends on many conditions, no fixed rule can be given. You will find in any good work on electricity rules which will enable you to determine approximately the size of electro-magnets for a given capacity.

(2) J. I. H. writes: I have a piece of table land with a gulch 250 feet deep on it. Fifty feet from the bottom is a spring running a two inch stream. By putting a hydraulic ram in the bottom of the gulch, I will have a head of fifty feet. Will a ram throw a stream to the top of the gulch? A. Yes; you will probably lift one-eighth to one-tenth the quantity of water running to the same from your spring to the top of the gulch.

(3) G. R. B. writes: In SCIENTIFIC AMERICAN, Vol. xlii., No. 15, you state in answer (10) to E. E. G. that it requires 106 lb. pressure to raise the safety valve under the given conditions. Please give the formula for obtaining said calculation, and oblige your reader. A. The lever is taken at 6 inches length from the valve = 21 lb. on the valve (excluding weight of lever), and $\frac{21{\cdot}0000}{0{\cdot}1963} = 106$ lb. nearly.

(4) W. S. F. asks what to apply to cloth to make it suitable for a small pair of bellows. A. Dissolve gum caoutchouc (native rubber) in about five times its weight of benzine or naphtha by digestion over a hot water bath away from fire. To one part of this solution add eight parts of boiled oil (warm), strain and keep warm (by a hot water jacket) while using.

(5) A. F. O. asks: Why must the materials of the gelatin printing pad be heated in a salt water bath? Suppose I use a simple fresh water bath, what then? A. The boiling point of salt water is higher than that of fresh. A greater heat may thus be obtained without danger of burning the composition.

(6) I. A. R. asks: 1. Is it possible so to destroy mill picks in tempering that they cannot afterward be tempered so as to be of any use? A. Yes. 2. Is milling a science or an art? A. Both. 3. What is the best modern work on milling? A. "Craik's Millwright and Miller."

(7) D. G. W. asks: Why does it take more length of piston rod to drive an engine's crank pin from one dead center to the quarter than it does from the quarter to the other dead center? A. Because of the angle of the connecting rod. If you drive the crank pin by a "slotted" cross head, you will find no such difference.

(8) R. K. writes: I wish to know if it would be advisable to run a steam hammer 166 feet from the boiler, even if the pipe was lagged with felt? If I get a steam hammer, I will have to use the boiler that distance or get a separate boiler. A. You can drive the steam hammer as you propose, but the steam pipe should be of large size, well protected, and a provision made for drawing off the water of condensation.

(9) G. F. W. writes: One of the hands says a piece of steel, ⅛ inch thick, taken from the tempering fire and allowed its own time to cool, will continue to draw while cooling; while I say the color changes but the temper does not. A. We are of the opinion that the temper changes with the color; the color is the index of the temper.

(10) R. D. asks: Can the telephone described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 142, page 2261, be made to talk over 50 feet of cotton covered wire by using a battery? A. Yes; use some form of carbon transmitter in connection with it.

(11) E. F. C. writes: 1. In constructing a steam boiler from mercury flasks, as described in your SUPPLEMENT, how many would I need to produce one horse power? A. Eight, six for water and two for steam chamber. 2. I understand that with a magneto-electric machine, properly arranged, an amount of power may be generated greatly superior to the primary source or inducing power. Why is this? Can the same be accomplished with an induction coil; if not, why? A. You are misinformed. The magneto-electric machine does not create power.

(12) W. H. W. asks: 1. What is the power required to drive the dynamo-electric machine described in SUPPLEMENT 161? A. One man power. 2. Can it be used to electro-plate small articles? A. Yes.

(13) W. R. M. asks: What shall I use to cement the edges of window glass to make a salt water aquarium? A. See receipt for aquarium cement, SUPPLEMENT, No. 157.

(14) T. S. B. asks: 1. What is the best pickle for cleaning brass castings? A. Use a nitric acid bath. Do not allow the articles to remain too long in this. 2. How are steel faces welded on cast iron anvils? A. By placing the steel in position in the mould and pouring in the melted iron.

(15) A. T. B. asks for a receipt for lacquer for brass, one that is thoroughly practical. A. Spirit of wine, 2 quarts; shellac, 2½ oz.; gum sandarac, ½ oz.; gum elemi, ½ oz.; mix and keep gently warmed for several days; strain, color with dragon's blood, and thin with 1 quart spirit of wine.

(16) C. M. M. asks: What is the cheapest fluid that will undergo exposure in pipes to a minimum temperature of 10° Fah. below zero without congealing, or becoming too viscid to flow readily at a velocity of 2 feet per second in a 1½ inch pipe—exposure to be for a protracted period? A. Have you tried a saturated aqueous solution of common salt and sulphate of soda?

(17) B. S. asks: 1. How can I ascertain the capacity of a centrifugal pump at different speeds? Its utmost capacity, I presume, would be the quantity of water contained in 500 feet of its suction pipe. A. There is no general rule, as it much depends upon the construction of the pump and height to which the water is to be lifted; the quantity of water in the pipe has little influence upon the quantity delivered. 2. Will not a centrifugal pump lift water with as much ease if placed 20 feet above the level of the water, as it would if only placed 5 or 10 feet above it? A. No; as the smallest air leak would have greater prejudicial effect.

(18) G. S. H. asks: 1. Can you give me an ink that may be applied to enameled calling or playing cards that will show perfectly plain, and that will not destroy the gloss; also tell me how to apply it? I wish a dark blue color, such as is often seen on the back of playing cards. A. Try printer's ink diluted with oil of lavender.

(19) J. L. P. writes: 1. I am building a fountain. Water pumped into reservoir 10 feet from ground by wind engine. Fountain a ¼ inch jet fed

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through a one inch gas pipe 50 feet from reservoir. Will I get about a 9½ foot jet? A. No; only 8½ to 9 feet. 2. How much water will it require to keep jet playing 24 hours under 10 feet head? A. About 160 gallons per hour. 3. What sized tub will I need to hold the required amount of water? A. Equal in capacity to say 100 barrels for 24 hours 4. Is there any danger from spontaneous combustion when 5 or 6 tons fine coal slack is piled in corner of a building out of doors exposed to weather? A. There is danger if it is slack of bituminous coal

(20) L. S. N. asks: How can I bleach or restore a switch of white hair which has turned yellow? A. Clean thoroughly and expose it moist to the vapor of burning sulphur in a box.

(21) A. A. B. asks: In a hot day does a person feel the heat more or less when the humidity is at its highest? A. An increase in humidity renders a warm atmosphere more oppressive.

(22) D. K. writes: Herewith please find a specimen of baryta found in this country. Will you be kind enough to answer through the proper column of your valuable journal the three following questions, namely: What the conditions are under which it is fouud in the earth; whether in veins or pockets? What its commercial value is both in its raw and manufactured state? What uses is it put to in the arts, etc.? A. Barite (called barytes and baryta), barium sulphate, occurs commonly in connection with beds or veins of metallic ores as part of the gangue. It is met with in secondary limestones, sometimes forming distinct veins, and often in crystals along with calcite and celestite. Its chief use in the arts is for the preparation of certain white pigments, as permanent white, Derbyshire white, etc., and for adulterating white lead. The flue ground mineral is quoted at ¾ to 1 cent per lb. barreled (600 to 700 lb. per barrel).

(23) J. H. A. asks: 1. How many yards should a suction pump draw water from a river up an incline of 15 feet? A. There is almost no limit if the pipe be perfectly tight and of sufficient size. 2. Does it not require less power to draw a given quantity through a large pipe than through a smaller one? A. Yes, within reasonable limits. 3. Would a (water tight) sleeve answer for the suction pipe? And if not, and the sleeve is not entirely tight, would it answer if buried one or more feet in the ground? A. If it is tight, yes; if not tight, burying in the earth will be of no benefit. 4. Would a valve on the lower end of a suction pipe be any advantage? A. Yes.

(24) F. E. B. asks: What light cheap substance can be put in a lath and plaster wall to deaden as much as possible sounds from one room to another? A. Dry saw dust or spent tan bark, well dried, is good. Sand would be effectual if the lathing is sufficiently strong to admit of its use.

(25) C. W. Y. asks how to prepare and polish shells (sea shells.) A. Porcelainous shells are so hard as to require the apparatus of a lapidary to cut or polish them, but they are generally so smooth as to require no rough grinding. They may be polished by using a felt wheel and applying putty powder. Nacreous shells or those of the pearl variety may be filed and cut without a great deal of difficulty. Pieces to be turned are first roughly shaped on the grindstone, then turned and polished with pumice stone, putting on the final polish with rotten stone. Irregularly shaped pieces are filed and ground, then smoothed with pumice stone and water, and finished with rotten stone. The rotten stone is sometimes mixed with sulphuric acid full strength, or slightly diluted to heighten the polish.

(26) C. W. F. asks: What will remove wheel grease from woolen material without injuring the color of the fabric? A. Have you tried naphtha or benzine? They affect neither goods nor colors.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

A. G. S.—1. A ferruginous slag—probably from some blast furnace. 2. Clay ironstone seamed with iron and copper pyrites. 3. A conglomerate sandstone; not ancient pottery. The supposed straw marks are ripple marks (from the action of water).—E. G. A.—1. Syenite. 2. Chiefly iron sulphide. 3. Graphite (plumbago) of some value. 4. Pyrrhotine (an iron sulphuret) containing a little copper. This ore may also contain silver. 5. Tourmaline.—C. D. G.—1. A cheap paint could be produced from it, but it would hardly repay the cost of the grinding, washing, roasting, and bolting necessary. 2. Would probably make a soft brick.—Mrs. C. F. W.—The "diamonds" are composed of silicic acid; much worn—by the water. They are worth about $100—an acre.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

May 18, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Air cooling apparatus, O. Kropff 227,796
Amalgamator, C. E. Ball 227,716, 227,717
Amalgamator, C. E. & R. E. Ball 227,718
Annunciator, electric, C. H. Perkins 227,704
Anti friction composition for bearings, J. Smalley 227,849
Axle, vehicle, Doolittle & Curtiss 227,678
Axle, wagon, J. B. Herman 227,777
Baking pan, A. W. Morgan 227,814
Bale wire inserting and bale dividing device, P. K. Dederick 227,616
Baling machine, hay, P. K. Dederick 227,677
Baling press, P. K. Dederick 227,617
Ball trap, B. Hempstead 227,776
Barrel swing, S. W. Sheldon 227,848
Binder, temporary, W. H. Bailey 227,715
Binder, temporary, R. Morris 227,699
Boat gang plank, A. K. Quinby 227,834
Boot and shoe, rubber, W. R. Miller 227,811
Boot and shoe sole buffer, J. W. Rogers 227,839
Boot treeing apparatus, Ambler & Wires 227,669
Boots and shoes, horn bearing for, Hudson & Burrill 227,631
Brick machine, W. B. Aitken 227,668
Bridge gate, C. C. Claussen 227,618
Bridge guard, P. Walling 227,664
Bridle binder, Gregerson & Weymouth 227,764
Brushing animals, machine for, N. Stow 227,857
Buckle, A. L. France 227,755
Buckle, I. L. Landis 227,798
Buckle, harness, H. W. Fuller 227,759
Bullet and shot machine, G. W. McCreary 227,807
Burial casket, J. A. Meyer 227,809
Button and stud, J. Newman 227,700
Button, detachable, D. S. Cooke 227,735
Button, separable, H. A. Carter 227,730
Can filling apparatus, G. H. Perkins 227,825
Can spout, T. C. Massey 227,697
Canals, etc., lock and lock gate for, Pouchet & Sautereau 227,831
Candle holder, J. W. Spear 227,660
Car coupling, W. N. Haring 227,770
Car coupling, S. F. Newland 227,819
Car coupling tool, W. G. Hurd 227,690
Car stock, E. G. Frisbie 227,754
Carbureter, C. W. Soule 227,853
Carding machine feeding device, J. H. Brackett 227,672
Carding machines, fleece dividing attachment for condensers for, J. S. Bolette 227,671
Carpet stretcher, S. D. Houpt 227,784
Carriage curtain fastening, C. Fockler 227,752
Carriage top, C. Fockler 227,751
Casting metals on a chill, mould for, T. M. Bissell 227,607
Chains, slip link for coupling, F. Kingston 227,793
Chair, Dexter & Chase 227,619
Chair for attaching to door steps, etc., E. E. Porter 227,832
Chenille twisting machine, F. W. Huppelsberg 227,788
Christmas tree candle holder, J. A. Kiesele 227,693
Churn cover, M. O. Stoddard 227,856
Clay and mortar, tempering wheel for, C. W. Raymond 227,835
Clock, electric circuit breaking, E. Holmes (r) 9,209
Clothes rack and mantle, combined, C. C. Field 227,749
Cock for beer and other casks, two-way, P. Krug. 227,797
Coffee grinding mill, J. C. Dell 227,742
Coffee pot, C. F. Matthes 227,805
Coffin handle socket, C. F. Mosman 227,817
Coffin handle tip, C. F. Mosman 227,816
Compound engine, M. B. Harvey 227,772
Copies of writing, producing multiple, E. Holtzmann 227,629
Cotton chopper, J. Warren 227,864
Cotton scraper, H. L. Lyon 227,802
Cotton, treating seed, W. P. Groom 227,767
Crucible furnace burner, Snow & Seamans 227,852
Cultivator, J. W. Davis 227,741
Cultivator, J. A. Gogel 227,687
Ditching machine, J. A. Railey 227,651
Door securer, J. Armstrong 227,712
Duster, feather, G. M. Richmond 227,837
Eaves trough hanger, F. Otto 227,702
Egg carrier, W. H. Wolfe 227,870
Egg tongs, R. P. H. Koska 227,633
Ejector, H. Coll (r) 9,199
Electric machine, dynamo, W. Sawyer 227,845
Electric switch cords, tip for, S. H. Bodfish 227,722
Electro-magnetic motor, W. W. Griscom 227,622, 227,623
Elevator, A. J. & R. S. Whittier 227,866
Elevator safety stop, F. Laufkotter 227,799
Embalming, S. Rodgers 227,654
Envelope, E. O. Bicknell 227,721
Fanning mill sieve, E. Harris 227,625
Fence post boring machine, K. Freeman 227,757
Fertilizer distributer, F. R. Glascock 227,762
Filter, reversible, B. T. Loomis 227,800
Filtering liquids, apparatus for, C. Ross 227,840
Fire kindler, C. H. Hayden (r) 9,201
Forge and steam boiler, combined, D. E. Engle 227,744
Furnace and apparatus for smelting ores and condensing fumes, H. W. Adams 227,710
Galvanic battery, W. V. Lockwood 227,801
Galvanic battery case, J. H. C. Watts 227,865
Gas meter, T. C. Hopper 227,783
Gas pressure regulator and indicator, F. W. Wiesebrock 227,867
Gasoline burner, W. C. North 227,701
Gate closing device, J. Kohnmann 227,794
Gig pad housing, F. C. Butler 227,610
Glass presses, clamp for securing plungers in, J. R. Bridges 227,608
Globe, Arkell & Richmond 227,713
Grain cutting machine, Heston & Purdy 227,626
Grain elevator, S. W. Neall 227,820
Grain meter, J. W. Hill 227,689
Grubber, W. R. Downing 227,620
Gun, air, A. G. Hyde 227,789
Guns, tripod support for machine, E. G. Parkhurst 227,648
Harness pads, machine for forming, W. R. Ferguson 227,748
Harrow, I. H. Reiner 227,836
Harrow, W. L. Waddy 227,862
Harrow or cultivator, Bramer & Crowley 227,724
Harrow tooth, W. S. Foster 227,683
Hay press, G. Ertel 227,681
Headlight, J. Hirth 227,628
Headlight case, R. C. Greenland 227,763
Heating and ventilating, C. M. Woodward 227,709
Heel and shank supporter, D. F. McKitrick 227,808
Hinge, gate, W. W. Robinson 227,838
Hinge, spring, D. W. Housley 227,786
Horse detacher, W. G. Cummings 227,740
Horse detacher, A. Ohlson 227,821
Horse power, J. H. Elward 227,745
Hub, vehicle wheel, D. May 227,806
Hydraulic pipe, D. G. Phipps 227,830
Ice cream freezer, Whitney & Killam 227,665
Ice making apparatus, C. C. Palmer 227,703
Insects, wire cloth fan for the destruction of, M. K. Taylor 227,706
Ironing table, folding, J. M. Shoaf 227,659
Journal box, A. Higley 227,627
Key hole guard, J. H. Browne 227,725
Knitting needles, machine for making the tongues of machine, W. Aiken (r) 9,206
Label, botanical, C. J. Schultz 227,658
Lamp, R. Cartwright 227,731
Lamp, street, G. P. Ganster 227,760
Latch, reversible, M. C. Niles 227,642
Life preserver, buoy, and boat, J. G. Hill 227,779
Leather, device for automatically measuring the superficial area of sides of, Tapley & Porter (r) 9,204
Lime kiln, W. A. Page 227,872
Lithographic process, A. Hoen 227,782
Locomotive engine, W. P. Henszey 227,778
Loom shuttle box mechanism, L. J. Knowles 227,694
Loom shuttle box motion, H. Wyman 227,667
Magnets, armature for electro, P. Wagner 227,863
Meat into cans, machine for packing, W. Steuerwald 227,854
Meat press, A. Thurston 227,860
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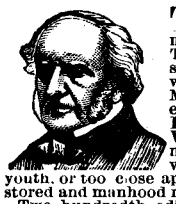

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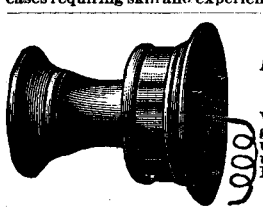

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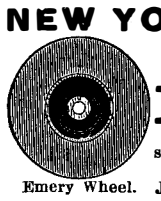

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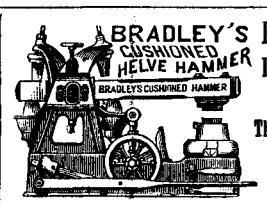

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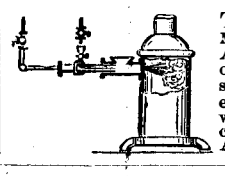

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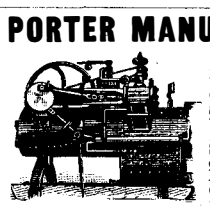

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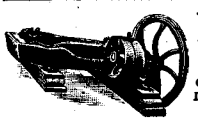

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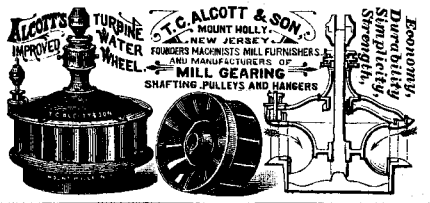
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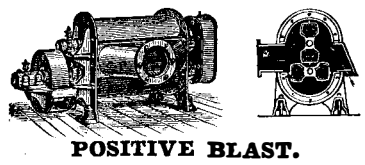

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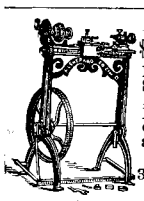

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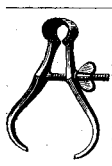

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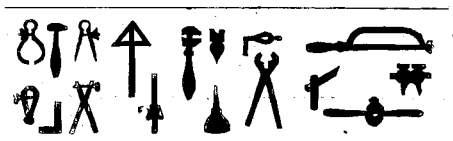

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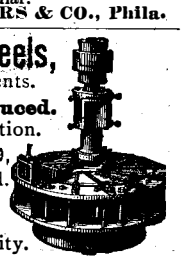

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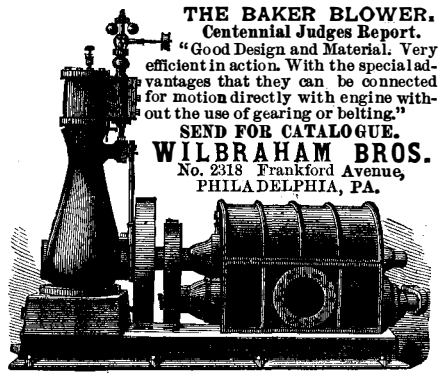

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